CHAPTER 7 COMPRESSORS

This chapter addresses the EPA's responses to public comments on compressors in the EPA's Proposed *Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources*.

Commenters also raised issues on topics that are not covered by this chapter. Please refer to the following chapters for responses specific to those issues:

- **Chapter 1**: Source Category
- **Chapter 2**: Regulation of Methane
- **Chapter 3**: Well Completions
- **Chapter 4**: Fugitives Monitoring
- **Chapter 5**: Pumps
- **Chapter 6**: Controllers
- **Chapter 8**: Equipment Leaks at Natural Gas Processing Plants
- **Chapter 9**: Liquids Unloading
- **Chapter 10**: Storage Vessels
- **Chapter 11**: Compliance
- **Chapter 12**: Regulatory Impact Analysis
- **Chapter 13**: Existing State, Local, and Federal Rules
- **Chapter 14**: Subpart OOOO
- **Chapter 15**: Miscellaneous
- **Chapter 16**: Comment Period Extension

TABLE OF CONTENTS

7.1 Centrifugal Compressors – Support for Proposed Standard

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 2:40 PM; Public Hearing #2 - Dallas, Texas
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 64

Comment: And then also, cover compressors and compressor stations, making sure that those are regulated.

Response: The NSPS rule covers centrifugal compressors and reciprocating compressors in the oil and natural gas sector at all locations other than at the wellhead. Compressor stations also have requirements for fugitive emissions monitoring in all segments.

Commenter Name: Haley Colson Lewis, Programs Manager and Michael Hansen, Interim Executive Director
Commenter Affiliation: GASP
Document Control Number: EPA-HQ-OAR-2010-0505-6436
Comment Excerpt Number: 3

Comment: Specifically, the 95% reduction standards for compressors and pneumatic pumps already available on site are strong and reasonable and should not be altered to cover less than a 95% reduction standard.

Response: Comment is a supportive comment to which no response is required. The EPA has finalized the requirements for compressors as proposed.

Commenter Name: Michael J. Meyers, et al., Assistant Attorneys General
Commenter Affiliation: Attorneys Generals of New York, Massachusetts, Oregon, Rhode Island, and Vermont (States)
Document Control Number: EPA-HQ-OAR-2010-0505-6940
Comment Excerpt Number: 8

Comment: The Proposed Standards for Compressors and Pneumatic Devices are Technically Achievable and Cost Effective. The Proposed Rule demonstrates that methane can be significantly and cost effectively reduced by establishing emission standards for methane from compressors and pneumatic devices. Centrifugal compressor emissions may be cost effectively controlled by installation of a capture and combustion device on wet seal compressors, while reciprocating compressor emissions may be controlled by the periodic replacement of rod packing systems. 80 Fed. Reg. at 56,619-21. Pneumatic controller emissions can be significantly reduced by replacing high-bleed controllers with either low-bleed or zero-bleed controllers. Methane emissions from pneumatic pumps can be cut in many instances by replacing the pumps at natural gas processing plants with instrument air pumps, and by routing emissions from pumps in the production, transmission, and storage segments to an existing control device or a process. Id. at 56,623-27. These findings are consistent with previous EPA determinations concerning this equipment and in other studies. See, e.g., Compressors White Paper at 43; Pneumatic Devices White Paper at 56-57; U.S. Envtl. Prot. Agency, Reducing Methane Emissions from Compressor Rod Packing Systems 1 (2006) (indicating payback periods from one to three months for compressor maintenance activities that reduce methane emissions); WRI Clearing the Air Report at 6 (replacing existing high-bleed pneumatic devices with low-bleed equivalents throughout natural gas system identified as one of three strategies that could cost-effectively cut methane emissions by thirty percent); Natural Res. Def. Council, Leaking Profits: The Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste 1 (2012) [hereinafter NRDC Leaking Profits Report] (identifying improved maintenance of reciprocating compressors and replacement of high-bleed pneumatic controllers with low-bleed or zero-bleed controllers as two of ten cost-effective strategies that could reduce methane emissions from the oil and gas sector by eighty percent).

Response: Comment is a supportive comment to which no response is required. The EPA has finalized the requirements for compressors as proposed.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 90

Comment: First, we agree that systems to capture gas from wet seal degassing, if properly designed, can be effective tools for reducing methane emissions from centrifugal compressors. EPA has published literature through its Natural Gas STAR program describing how degassing

systems equipped with the proper technology—seal oil/gas separators, demisters/filters for both high and low- quality gas, and necessary piping and instrumentation—are cost effective and can largely eliminate vented gas from wet seal compressors. EPA literature presents four different options for using gas that is captured through these devices: 1) return it to compressor suction; 2) route high-pressure gas to a combustion turbine for electricity generation; 3) route low-pressure gas to a heater or boiler to use as fuel; and 4) send the captured gas to a control device. EPA notes that at least one operator has configured its system to use all four of these options. Based on experience from about one hundred installations, BP has reported that systems that return seal gas to compressor suction (the first option) are "simple, broadly flexible, and reliable," and generate "positive cash flow in less than a month." In addition, both California and Ohio have proposed requirements for centrifugal compressors that require either the capture of wet-seal emissions or the use of dry-seals. Specifically, the California's Air Resources Board (ARB) proposes to require operators either use dry seal systems or collect the wet seal vent gas with a vapor collection system. The Ohio EPA similarly proposes operators design wet or dry shaft seals on centrifugal compressors to ensure that no gas is vented from the unit. To accomplish this operators must capture 100% of the gas from the wet or dry shaft seals and route it to a pipeline, fuel gas system, or flare capable of a 98% destruction efficiency.

From both an environmental and economic standpoint, the fourth option is decidedly inferior to the other three, since it generates emissions without providing a beneficial purpose. Yet in the proposed regulatory language, EPA assumes as an initial matter that operators will route gas captured through a wet seal degassing system to a control device, describing routing to a process as an "alternative." Proposed 40 C.F.R. § 60.5380a(a)(2). The agency has provided no justification for this implied prioritization of combustion over conservation, and we are aware of none. Instead, the final rule should require operators to select one of the first three uses for captured fuel described above, which should be readily available options in nearly all instances. EPA should allow for the use of a control device only if the operator can demonstrate that the other three options cannot be employed at a specific installation.

In fact, in the Proposed Rule preamble with respect to the new REC standards for oil wells, EPA finds capture of the gas through REC to be preferable to combustion on the following basis: "we determined that combustion alone would not represent the BSER for well completions because, although the emissions reduction would be equal to the REC and completion combustion device combination (i.e., 95 percent control), the opportunity to realize gas recovery would be minimized and the generation of secondary combustion related emissions would be increased." 80 Fed. Reg. at 56,629.

Response: See response to DCN EPA-HQ-OAR-2010-0505-7062, Excerpt 6. For wet-seal centrifugal compressors, we have determined that capture and routing of emissions to a control device is BSER. While we agree that routing to a process could provide equal to or greater emission reductions, we do not have enough information in the record to establish routing to a process as BSER for wet-seal centrifugal compressors. With respect to the oil well requirements, BSER for oil wells is a REC which requires gas capture, combined with combustion of gas that cannot be captured during the REC. Therefore, the BSER determinations are not the same and cannot be compared.

7.2 Centrifugal Compressors – Opposition to Proposed Standard

Commenter Name: Rodney Sartor
Commenter Affiliation: Enterprise Products Partners L.P.
Document Control Number: EPA-HQ-OAR-2010-0505-6807
Comment Excerpt Number: 8

Comment: The proposed NSPS imposes the same requirements for centrifugal compressors regulated under Subpart OOOO in the gathering and boosting stations, and natural gas processing plants, on centrifugal compressors within the transmission and storage segment. We believe that additional controls for the transmission and storage sector are unjustified and unnecessary by regulation because these compressors do not meaningfully contribute to the emission of VOCs or methane, and the compliance costs associated with these regulations cannot be justified by the minute reductions in emissions that would result.

EPA has estimated that this new requirement will result in $114,146 in annualized costs per unit at storage facilities. If true, this addition cost burden cannot be justified by the small decrease in methane emissions that would be attributable to the new regulations. As industry groups such as the Interstate Natural Gas Association of America ("INGAA") have already indicated to EPA, gas emissions from wet seal compressors do not meaningfully differ from the emissions from dry seal compressors. As EPA cannot demonstrate that wet seal centrifugal compressors at midstream compressor stations have a meaningful impact on methane or VOC emissions, the agency should not unnecessarily expand regulations to these facilities.

Response: The EPA disagrees with the commenter that centrifugal compressors in the transmissions and storage segment do not have emissions that would warrant regulation. None of the data available to the EPA supports that wet seal centrifugal compressors in transmission and storage have lower emissions than those cited in the TSD for the final rule. We also note that, while INGAA's comments asserted that lower emissions for these compressors is common, it did not provide data supporting this claim. Based on the data available in the record, we conclude that the control of methane emissions for wet seal centrifugal compressor in transmission and storage is reasonable, and have finalized the centrifugal compressor standards as proposed.

7.3 Centrifugal Compressors – Best System of Emission Reduction

Commenter Name: Gary Buchler
Commenter Affiliation: Kinder Morgan, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6857
Comment Excerpt Number: 69

Comment: Kinder Morgan submits the following specific comments regarding EPA's proposals relating to other equipment and affected facilities.

Wet Seal Centrifugal Compressors
EPA proposes that if an operator "modifies" (as discussed in more detail in Section V(I)(1), below) a wet seal centrifugal compressor affected facility, the operator would need to reduce methane and VOC emissions by 95% from that compressor. In order to meet the 95% emissions reduction, EPA proposes to allow operators to either (1) capture and route the emissions utilizing a cover and closed vent system to a control device; or (2) route the captured emissions to a process.

Kinder Morgan is the largest energy infrastructure company in North America, yet it does not have experience in routing emissions from a wet seal centrifugal compressor affected facility to either a control device through a closed vent system, or to a process. This strikes Kinder Morgan as extremely problematic insofar as EPA's proposal is untested—and as a result, the potential impacts, costs, technical, operational, or safety effects are largely unknown. EPA's proposal stems from the 2012 NSPS OOOO rule stating that "the proposed VOC and methane standards described above are the same as the wet seal centrifugal compressor standards currently in the NSPS." While the centrifugal compressor itself may be the same in different industry sectors, EPA fails to account for the significant operational differences between the industry sectors and the technical, safety, and operational feasibility of, for example, capturing and routing emissions from a wet seal centrifugal compressor to a closed vent system and control device or to a process at Kinder Morgan facilities. Attempts to capture a low-pressure natural gas vent stream could result in inducing air into the stream, potentially creating a combustible mixture.

As an alternative to the routing options, EPA states that "[w]e also consider replacing wet seal system with a dry seal system due to its inherent low emissions." Kinder Morgan strongly objects to this proposal because (1) data indicates that a well maintained wet seal will have methane emission rate comparable to or lesser than dry seals; (2) conversion from a wet seal to a dry seal system is not cost-effective; and (3) in many cases, conversion from a wet seal to a dry seal may not be technically feasible.

First, the average emission rate from Kinder Morgan's centrifugal compressors equipped with wet seals is significantly lower than the average rate identified in EPA's National Inventory for this kind of source. Second, in recent years, Kinder Morgan has obtained proposals to replace wet seals on specific Ingersoll Rand (IR) model CDP24 (July 2012) and Solar Centaur 40 T4702S (May 2014) centrifugal compressors. These IR and Solar centrifugal compressors are common, but not the only centrifugal compressor models used in the natural gas transmission and storage sector. The capital costs for these wet seal replacements ranged from $65,000 to over

$850,000. Wet seals are an integral component of a centrifugal compressor, and as such, wet seal replacement with a dry seal is not a routine, simple, quick, or inexpensive task, and is in fact infeasible in many circumstances. Replacement of a wet seal requires that the centrifugal compressor unit be shipped back to the manufacturer or other service company to complete the wet to dry seal replacement. Costs include the wet seal replacement costs, transportation costs, and customer impacts since the compressor unit will be out of service for an extended period of time to complete the replacement.

Finally, Kinder Morgan requests that EPA clarify in its preamble to any final rule that for existing centrifugal compressors with wet seals, routine maintenance and repair does not qualify as a "modification" or reconstruction so as not to trigger applicability of operational and other requirements under NSPS OOOOa. For example, EPA should clarify that commonly accepted turbine component changes (e.g., like-or-like) do not constitute modification or reconstruction for purpose of triggering requirements under NSPS OOOOa.

Response: We appreciate the information provided by the commenter regarding the costs to replace wet seal on centrifugal compressors in the transmission and storage segment. We recognize that, in some circumstances, replacement of wet seals within a compressor with dry seals may be cost prohibitive or infeasible, so the final rule provides that capture and routing to a control device or a process is BSER. We also agree that there may be wet seal compressors in use in the industry that have lower than the average emissions levels used in the analysis, however, the rule is based on the best available emissions data for these sources and, as an average of source emission data, incorporates in the range of source emission profiles. We do not have data that identifies a specific type, size, brand or other criteria by which to identify these low-emitting compressors referenced by the commenter.

With respect to the commenter's concern that routine maintenance and repair of a compressor with wet seals would trigger a modification under the rule, we note that routine maintenance is not considered to be a modification or reconstruction under the definition of modifications in the §60.14 of general provisions.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 7:55 PM; Public Hearing #1 - Denver, Colorado
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7337
Comment Excerpt Number: 233

Comment: My name is Casey Quinn. I represent the members of Powder River Basin Resource Council. Our council represents roughly 1,000 members, 1000-plus members, and about half of those live near oil and gas production facilities.

First and foremost, we commend the EPA for heading in the right direction by seeking to cut oil and gas emissions, for the sake of public health and reducing climate impact. That said, we do

believe these proposed rules should be taken a bit further if the EPA is serious about limiting emissions. I'm going to reiterate much of what Ms. Hall said and Ms. Ham said.

Specifically, concerning compressors at transmission facilities, we recommend that the EPA increase the proposed 95 percent control of wet seal emissions to 98 percent control. This is available and achievable through current combustion technology.

Response: See response to DCN EPA-HQ-OAR-2010-0505-7240, Excerpt 3.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 7:55 PM; Public Hearing #1 - Denver, Colorado
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7337
Comment Excerpt Number: 229

Comment: EPA should increase the proposed 95 percent control of wet seal emissions to 98 percent control, which is achievable through current technology;

Response: See response to DCN EPA-HQ-OAR-2010-0505-7240, Excerpt 3.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Tuesday, September 29, 2015; 9:05 AM - 8:00 PM; Public Hearing #1 - Pittsburgh, Pennsylvania
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7338
Comment Excerpt Number: 117

Comment: Concerning centrifugal compressor seals, we do agree that dry gas seal technology offers the best solution. Rerouting leakage from wet oil. We're getting compressor seals to capture erratic flares and manage to reduce methane levels by up to 95 percent. However, there are some factors that have been neglected in this analysis. And we'll provide them later in written comments.

We also believe that there are circumstances where the switch from wet compressor seals to dry compressor seal is economically warranted. It is true that the switch to dry gas seal is not technically feasible in all circumstances. But there are instances where it is technically and economically feasible. And the FSA has developed a calculator tool to determine when this is the case. And we'd like to have the use of the tool considered to determine what might be the best system of emission reduction. Fugitive emissions are what FSA members concern themselves with.

Response: The final rule defines BSER for centrifugal compressors as routing emissions from a wet seal to a control device. The final rule does not define dry seals as affected facilities nor does the final rule establish switching to a dry seal as BSER for centrifugal compressors. We respond to the comment regarding the fugitive emission calculation tool under a separate comment excerpt. See response to DCN EPA-HQ-OAR-2010-0505-6754, Excerpt 5.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 6

Comment: Compressor are likewise a potentially significant source of emissions, and we recommend EPA: Require operators to capture emissions from each wet seal degassing system and route back to process, to a pipeline or use it onsite for a beneficial use. Routing emissions to a control device that destroys rather than utilizes these emissions should be permitted only as a last resort.

Response: The EPA has determined that BSER is routing emissions to a control device which results in an emission performance standard of a 95 percent reduction. The final rule notes that this standard can alternatively be achieved by routing to a process. The requirements of the final rule reflect an emissions limitation that is achievable through the application of the BSER and do not in themselves require sources to implement the BSER. That is, the EPA is responsible for determining the level of emission limitation from the source category, while sources are required to achieve that level of emission limitation. Sources may choose from multiple emission reduction measures, including measures that are not part of the BSER.

Commenter Name: Henri Azibert, Technical Director
Commenter Affiliation: Fluid Sealing Association (FSA)
Document Control Number: EPA-HQ-OAR-2010-0505-6754
Comment Excerpt Number: 4

Comment: Concerning centrifugal compressor seals Section VII B. and VIII B, we do agree that dry gas seal technology offers the best solution in almost all circumstances. Rerouting leakage from wet (oil lubricated) compressor seals to capture or routing to flare has been estimated to reduce emission levels by up to 95%. However some factors have been neglected in this analysis. Flares are not 100% efficient, which contributes to air pollution, and the energy present in compressed gas that is released to flare is lost. (To comment on p. 153 of the proposed regulation, we believe that there are air and energy impacts associated with the control techniques. Energy is dissipated when bringing compressed gas to flare pressure levels, and further energy is lost when the fuel is combusted by flare). We also believe that there are circumstances where the switch from wet compressor seals to dry compressor seals is economically warranted.

It is true that the switch to dry gas seal is not technically feasible in all circumstances (p. 147 of the proposed rule), but in most instances, the use of dry gas seal technology for centrifugal compressors is technically, environmentally and economically the most viable option. There are even circumstances where it is particularly attractive, such as in off-shore platforms, where the elimination of the oil support system and the degassing equipment required for wet seals frees up extremely limited available space.

Response: We acknowledge that flares and combustors are not 100 percent effective, and we have determined that BSER is routing emissions to a control device which results in an emission performance standard of a 95 percent reduction. As the commenter notes, there are circumstances where the switch to dry seals is not technically feasible and therefore we are not determining that switching to dry seals is BSER. However, we note that there may be multiple ways in which sources can meet the emission reduction requirements.

Commenter Name: Josh Nordquist
Commenter Affiliation: Ormat Technologies
Document Control Number: EPA-HQ-OAR-2010-0505-7059
Comment Excerpt Number: 3

Comment: Ormat's ORC application for Waste Heat Recovery, which we call Recovered Energy Generation (REG) units, has been applied successfully on 20 natural gas pipeline compressor stations in North America alone.

We believe that waste heat recovery on natural gas transmission pipelines is an important mechanism for reducing the lifecycle climate impact of the natural gas supply chain. We commend EPA and the Administration for recognizing the climate impacts of an inefficient natural gas delivery system and for beginning to scope out methods for improvement. We also ask that technology solutions like Ormat's REG units be made eligible as one compliance pathway under the final rulemaking.

Description of Pipeline Compressor Control Technology. Ormat's REG units use a power-generation technology based on the classic Rankine Power Cycle, using the heat from an industrial process as its "fuel feedstock." This heat is traditionally released into the ambient air. Ormat has installed the majority of its REG units on natural transmission gas pipelines. Most compressors on large interstate natural gas pipelines expel heat at about 900° F. Ormat's REG units capture and convert this, normally wasted, heat into electricity that can then deliver electricity back to the electric grid or to support a large load directly. Ormat has REG solutions in place at 19 gas pipeline compressor stations in North America alone, each generating from 4 to 8MW of fuel-free electricity. Together, these stations provide over 100 megawatts of emission-free power generation, enough for over 80,000 households.

For a typical REG installation, the business arrangement includes a waste heat host agreement between the pipeline owner and the REG owner. The compressor station owner actually receives a royalty or waste heat host fee for the usage of the heat produced by the compressor station in

the REG process (when this heat is normally wasted). The operations of the pipeline and compressor station on which the REG facility is installed are not impacted by the operation of the REG facility. The ownership of the unit and any benefits associated with the project, including Renewable Energy or environmental credits, are determined during initial negotiations with the pipeline owner/operator and recipient(s) of the electricity produced.

Recommendations. Presently EPA's proposal for new and modified compressor stations includes new requirements for detecting and repairing methane leaks and a 9% reduction of methane emissions from some types of compressors. EPA prescribes that the required reductions should be achieved by capturing and routing emissions to a control device or into another process for beneficial reuse, and that where fugitive emissions are detected by the required monitoring technologies, the offending component must be replaced or repaired within 15 days.

On page 120 of the draft rule, EPA solicits comments on alternative methods of compliance for meeting the NSPS standards for compressor stations.

Recommendation 1: Make waste heat to power technologies such as REG a compliance pathway. Technology solutions beyond simple patching of leaks that reduce the lifecycle greenhouse gas impact of the natural gas supply chain, including WHP, should be compliance methods under the final rule. On page 10 of the draft rule, EPA explains that methane emissions are being regulated for the first time under NSPS because of their role as a greenhouse gas, which endangers public health and public welfare. If the desired outcome of the rulemaking is reducing lifecycle greenhouse impacts of the source category, WHP is an appropriate, proven technology strategy for achieving that outcome. WHP and REG generate electricity from the heat of already existing (or new) compressor station exhaust, dramatically increasing the efficiency of the process without any additional fuel consumption and, hence, no additional emissions. In addition, REG is a technology that can be applied to both turbine and reciprocal based compressor station technology available today.

As a model for how this could work, EPA can examine other Clean Air Act programs including New Source Review. Offsets have long been available to regulated parties subject to New Source Review. For example, heavy-duty trucks subject to New Source Review can use idling reduction technologies as offsets against their emissions profile. Any offset must be quantifiable, surplus, permanent and federally enforceable. The concept of how offsets might work under New Source Performance Standards was considered in a 2010 paper by Resources for the Future, available at http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-10-24.pdf. RFF identifies an emissions trading system for waste incinerators as an existing offsets schematic under NSPS.

If WHP were accommodated as an offset for methane emissions from the gas supply chain, it would be easy to translate the greenhouse gas savings from each MWh of emission-free power generated (and their associated GHGs avoided) to an equivalent volume of methane in CO2 equivalent.

For example: If the electricity generated from a WHP unit on a pipeline compressor displaces electricity from an average coal fired power plant, each MWh will save approximately 1.0 tons of CO2. At designed capacity, a standard 5 MW Ormat REG facility on a compressor station can

save 43,800 tons of CO2 per year. Using EPA's Methane Emissions Reductions Calculator to interpret the avoided carbon benefits of WHP into an equivalent value for avoided methane, this 5 MW unit would reduce that single compressor station's GHG impact by an equivalent of about 1,750 tons of CH4 annually. Regulated parties, pipeline owners and operators, should be able to incorporate these equivalent savings toward their 95% reduction requirement for methane.

Regarding enforceability, the achievement of emissions reductions at WHP-installed compressor stations could easily be verified by evaluating the daily, monthly or annual electricity output of the WHP unit. The greenhouse gas savings ability of an Ormat REG unit is simply a function of the unit size, its operating hours, and what type of electricity production it displaces.

The addition of WHP as a compliance pathway would allow regulated parties more flexibility to meet the requirements of the final rulemaking. It may also present the far lower cost pathway to compliance where it is prohibitively expensive to achieve sufficient improvement through direct emissions reductions.

General Comments. By classifying waste heat to power as a pathway to mitigation of the impacts of methane leaks and flaring, EPA can provide the natural gas supply chain with greater flexibility to achieving measurable improvements. We also note that while Ormat has introduced a type of waste heat technology directly applicable to pipelines, there are many other potential applications for waste heat to power across the gas supply chain, including on gas processing plants, natural gas engines, flare gas and LNG import/export facilities

Attachments.

- Figure A: Schematic of an Ormat Recovered Energy Generation (REG) waste heat capture system
- Figure B: Photo of a 6 MW REG Unit on a Compressor Station in North Dakota
- Figure C: Photo of a 4 MW REG Unit on a Compressor Station in Peetz, Colorado
- Figure D: Photo of a 5.5 MW REG Unit on a Compressor Station in Wetonka, South Dakota
- Figure E: Photo of a 6.8 MW REG Unit on a Compressor Station in Goodsprings, Nevada

Response: The EPA appreciates the information on waste heat recovery technology for the natural gas pipeline industry. The EPA agrees that this technology is an emerging potential technology to reduce emissions from methane and other pollutant by using waste heat to generate electricity, thus replacing power needed from power generation facilities. Although life cycle emission reductions are valuable, we do not believe this technology is readily applicable to reducing methane and VOC emissions from the individual sources that are the subject of this rule.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 89

Comment: These basic requirements represent a positive starting point, but EPA must go further to ensure that the standards reflect BSER. In particular, EPA should structure its regulations to ensure that captured gas is burned off in a control device as seldom as possible. The regulations should ensure that the captured gas is utilized, either by directing the captured gas back into the pipeline system or by routing it to use as fuel on site, as frequently as possible. In general, gas from wet seal degassing can readily be directed to compressor suction, and at many sites there will be other ways to utilize this gas, such as directing it to a VRU or using it as a portion of the fuel gas for equipment on site. For the infrequent cases where operators conclude that none of these options is workable, the burden must be on the operator to demonstrate this infeasibility. Given the rarity of wet-seals in newly installed centrifugal compressors, requiring operators to demonstrate the need to use a control device rather than utilizing gas from a wet-seal degasser would not impose additional burden. Below, we provide a number of recommendations that EPA should take to embody this principle and improve the efficacy of the standards.

Response: See response to DCN EPA-HQ-OAR-2010-0505-7062, Excerpt 6.

Commenter Name: Jill Morrison
Commenter Affiliation: Powder River Basin Resource Council
Document Control Number: EPA-HQ-OAR-2010-0505-7240
Comment Excerpt Number: 3

Comment: Regarding compressors at transmission facilities we recommend that EPA increase the proposed 95% control of wet seal emissions to a 98% control. This is readily available and achievable through current combustion technology.

Response: The EPA has determined BSER for centrifugal compressors to be routing emissions to a control device which achieves 95 percent control. The 95 percent requirement is based on the demonstrated control efficiency of a combined closed vent system with a control device. The EPA has not found demonstrated consistent control efficiency in the field at greater than 95 percent, and therefore, maintains the 95 percent control efficiency.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 7:55 PM; Public Hearing #1 - Denver, Colorado
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7337
Comment Excerpt Number: 252

Comment: Regarding compressors at transmission facilities, we recommend that the EPA increase the proposed 95 percent control to 98 percent control, and this is readily available and achievable, as I understand it.

Response: See the response to DCN EPA-HQ-OAR-2010-0505-7240, Excerpt 3.

Commenter Name: Kathleen M. Sgamma, Vice President, Government and Public Affairs
Commenter Affiliation: Western Energy Alliance
Document Control Number: EPA-HQ-OAR-2010-0505-6930
Comment Excerpt Number: 54

Comment: The proposed rule should also clarify that a control system using wet seals with a closed vent system or a dry seal system is an acceptable control strategy. This was permissible under NSPS OOOO. The same rationale still applies and the two rules should be consistent.

Response: The EPA disagrees with the commenter that subpart OOOO and OOOOa are inconsistent with regard to centrifugal compressor requirements. These sections are identical except in scope. Dry seal compressors are not affected facilities in either subpart OOOO or subpart OOOOa, and subpart OOOOa also sets BSER as routing emissions to a control device.

Commenter Name: Henri Azibert, Technical Director
Commenter Affiliation: Fluid Sealing Association (FSA)
Document Control Number: EPA-HQ-OAR-2010-0505-6754
Comment Excerpt Number: 5

Comment: The FSA has developed a life cycle cost calculator tool for centrifugal compressors to analyze the relative merits of the various options and will make the tool freely available to help determine what might be the Best System of Emission Reduction. This comprehensive tool calculates the energy consumed from the seal and the support system, the compressed gas energy released, and the pipe friction from oil contamination. It takes into consideration the annual operating costs including maintenance costs, the value of leaked gas, consumables, and the cost of all the energy consumed, which is quite considerable in wet seal systems. Taking into account one-time costs such as total retrofit costs, it calculates payback period, the present value of the annual operating costs over the lifespan remaining, and the total life cycle cost.

In addition to analyzing the above listed variables the tool also calculates the equivalent CO2 emissions from the entire compressor shaft sealing system. Methane releases are not the only emissions detrimental to the environment. The increase in energy consumption form wet seal systems need to be factored in. Another source of emissions that has not been considered in the proposed regulation is the release of methane from pipe lines that occurs during depressurization required for the cleaning process (pigging) to remove the oil contamination that has been infused into the piping system from the compressor shaft seal leakage.

The life cycle cost calculator, developed by FSA Mechanical Seal Division members can be tailored to local conditions for individual cases and thus can help our oil and gas customers confirm the economic and environmental value propositions between re-routing the gas, flaring, or retrofitting the centrifugal compressors with dry gas seal technology.

Response: We appreciate the information that commenter has provided on this emissions calculation tool. It appears to be a valuable tool for owners/operators to use in estimating emissions from the life-cycle of equipment. However, we have based the final standard on the best available emissions data for individual sources subject to the rule in determining BSER.

Commenter Name: Howard J Feldman
Commenter Affiliation: American Petroleum Institute
Document Control Number: EPA-HQ-OAR-2010-0505-6884
Comment Excerpt Number: 167

Comment: The control costs for routing a wet seal compressor vent to an existing control device was estimated by EPA to be $23,252, as indicated in Section 2.2.1 above. We believe this cost to be more representative of the true uninstalled capital cost of the control option.

Response: The EPA appreciates the commenter's assessment of our cost estimate. We have finalized the centrifugal compressor requirements as proposed.

Commenter Name: Theresa Pugh
Commenter Affiliation: Interstate Natural Gas Association of America (INGAA)
Document Control Number: EPA-HQ-OAR-2010-0505-6872
Comment Excerpt Number: 38

Comment: Compliance costs (and cost benefit) could be an important issue in select cases where "applicability" triggered for existing units results in measures such as installation of control systems, or more extreme measures such as replacing wet seals with dry seals or unit replacement. Retrofit feasibility and peripheral costs could result in inordinate costs such that replacement is the only viable option. Since wet seal emission rates can vary – and are similar to dry seals in some cases – this requirement could be triggered with little or no environmental benefit.

The associated benefit is an important issue. As discussed earlier, EPA has failed to consider emissions information being compiled from Subpart W reporting for centrifugal compressors. Industry stakeholders are reviewing that information, and it indicates centrifugal compressor wet seal emissions are far lower than EPA's current estimated. Closer scrutiny is warranted to leverage important insights that can be gained from Subpart W measurements.

INGAA also recommends that EPA complete a thorough analysis of GHG Reporting Program data, which includes measurement of wet seal emissions for Subpart W T&S facilities. INGAA

believes that such a review is likely to indicate that EPA should reassess the perceived environmental benefits from mitigation of wet seal degassing vent emissions, and reconsider whether this equipment category should be included in the regulation.

Response: We developed the rule based on average emission rates based on the best available emissions information. The average rates take into consideration the commenter's concerns that some wet seal centrifugal compressors are lower emitting, however, we do not have any data or specific information on which to base a conclusion that a certain subset or type of wet seal centrifugal compressors is lower emitting and should be treated differently under the rule. The EPA is finalizing the proposed emission standards for centrifugal compressors this final rule. We also note that the data in the record indicates that replacing wet seals with dry seals could also potentially achieve significant emission reductions.

The compressor emissions that are reported under the petroleum and natural gas systems source category of the Greenhouse Gas Reporting Program (subpart W) reporting represent a portion of the industry; a facility is required to submit annual reports if total emissions are 25,000 metric tons CO_2 equivalent or more. However, the Greenhouse Gas Reporting Program data support our projections that significant emission reductions can be achieved by replacing wet seals with dry seals. See, e.g., Greenhouse Gas Reporting Rule: Technical Support for 2014 Revisions and Confidentiality Determinations for Petroleum and Natural Gas Systems; Final Rule, Docket Id. EPA-HQ-OAR-2011-0512 (showing a summary of compressor-specific reported emissions data to the Greenhouse Gas Reporting Program and supporting the conclusion that, on average, dry seal compressors have significantly lower emissions than wet seal compressors). Therefore, we are maintaining requirements related to control for wet seal compressors.

Commenter Name: Howard J Feldman
Commenter Affiliation: American Petroleum Institute
Document Control Number: EPA-HQ-OAR-2010-0505-6884
Comment Excerpt Number: 168

Comment: *Overestimate of Centrifugal Compressor Baseline Emissions*

EPA based the wet seal centrifugal compressor baseline emissions on the emission factors from the US GHG Inventory: Emission and Sinks 1990-2012. The emission factors for wet seal centrifugal compressors was based on a sampling of 48 wet seal centrifugal compressors, and derived from the emission rate and percent of time the compressor was in pressurized mode. According to the Interstate Natural Gas Association of America in comments to EPA on the Methane White Paper on Compressors, the US national GHG inventory values are reported to be over 30 times higher than values found in Subpart W reporting. Since Subpart W reporting reflects recent industry practices, and is based on measured emission rates for compressors in transmission and storage, it is considered to be more accurate.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6872, Excerpt 38.

7.4. Centrifugal Compressors – Other

Commenter Name: Anthony Pocengal
Commenter Affiliation: Solar Turbines Incorporated
Document Control Number: EPA-HQ-OAR-2010-0505-6812
Comment Excerpt Number: 4

Comment: 60.5365a(j) – Compressor Station 'Modification'

Considering an existing compressor station equipped with a centrifugal compressor which uses wet seals; if compression capacity is added to the existing site, would this require 95% reduction of the wet seal de-gas emissions or a retrofit to a dry seal system, even though no activity is occurring on the compressor with the wet seals? ... Also, In the case of a compressor re-stage where an existing compressor is reconfigured to handle a larger gas flow, would this also trigger this new definition of 'modification' even though the restage itself will not cause an increase in emissions?

Response: The affected facility for the wet seal centrifugal compressor requirements is the compressor not the compressor station. The requirements for reconstruction and modification are based on the default definition of modification of an affected facility which is....'

"§ 60.14 Modification.

(a) Except as provided under paragraphs (e) and (f) of this section, any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere...."

Therefore, if a compressor affected facility is modified to increase compression capacity and that increase results in an increase in emission, then it would trigger the 95 percent reduction requirements in the NSPS.

Commenter Name: Pamela Lacey, Chief Regulatory Counsel
Commenter Affiliation: American Gas Association (AGA)
Document Control Number: EPA-HQ-OAR-2010-0505-6936
Comment Excerpt Number: 18

Comment: EPA Should Clarify Its Intention To Only Regulate Centrifugal Compressors, Reciprocating Compressors, And Pneumatic Devices At Compressor Stations.

Based on EPA's summary of the proposed rule in the preamble and support documents, AGA believes that EPA only intends to regulate centrifugal compressors, reciprocating compressors, and pneumatic devices at compressor stations. Thus, this equipment located outside of the

compressor station fence line, for example at metering stations, would not be affected. However, the applicability sections and definitions in the proposed rule could lead to the conclusion that these equipment types are affected sources in T&S regardless of their location—i.e., not limited to equipment at compressor stations.

AGA encourages EPA revise section 60.5365a as follows so that it is clear that the "affected facility" for this equipment is limited to equipment at compressor stations.

(b) Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals, located at a compressor station site as defined in §60.5430a. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

(c) Each reciprocating compressor affected facility, which is a single reciprocating compressor, located at a compressor station site as defined in §60.5430a. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

(d)(1) Each pneumatic controller affected facility not located at a natural gas processing plant, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh, located at a compressor station as defined in §60.5430a.

If EPA intends for its proposed rule to have broader applicability by including this equipment not located at compressor stations, such as devices at small metering stations, then EPA's supporting analysis justifying its proposed rule is lacking. Additional analysis would be needed to accurately assess the costs and benefits associated with regulating this equipment outside of the compressor station fence line.

Response: The EPA disagrees with the commenter's proposed clarification. The EPA intends to regulate centrifugal compressors and reciprocating compressors at any location within the sector with the exception of at a well site, as noted in the affected facility definition. Likewise, the final rule regulates pneumatic controllers at any location within the sector, and pneumatic pumps at a well sites and natural gas processing plants.

Commenter Name: Theresa Pugh
Commenter Affiliation: Interstate Natural Gas Association of America (INGAA)
Document Control Number: EPA-HQ-OAR-2010-0505-6872
Comment Excerpt Number: 28

Comment: For Existing Centrifugal Compressors with Wet Seals, EPA Should Clearly Indicate that Routine Maintenance and Repair Does Not Trigger Applicability.

For existing units, interpretation of modification and reconstruction provisions is not always straightforward. The history of determination requests for other NSPS in EPA's Applicability

Determination Index demonstrates this fact. For centrifugal compressors, only units with wet seals are affected units. For new installations, turbines with dry seals are installed and these units are not subject to the Proposed Rule. Dry seals have been common for over ten years, but a number of existing wet seal units remain in operation. Thus, the Proposed Rule would most likely affect existing centrifugal compressors that are modified or reconstructed. INGAA is concerned with regulatory interpretations that could unnecessarily change the status of existing units. EPA should provide additional background regarding exemptions when routine maintenance or repair is conducted. Additional evaluation is also needed regarding the potential high costs and minimal benefits associated with retrofit "control" of an existing centrifugal compressor with wet seals.

It is important to understand that some situations (e.g., associated with reconstruction or modification determinations for existing units with wet seals) could introduce unreasonable regulatory costs. EPA needs to properly consider reasonable scenarios and associated outcomes. INGAA discussed this with EPA during development of the original Subpart OOOO rule in 2011 and 2012. Existing units with wet seals that become subject to Subpart OOOO could be faced with extraordinary costs. The final rule should clearly indicate that routine repair and maintenance, including long-established component replacement programs, do not trigger Subpart OOOOa applicability.

INGAA recommends that EPA more clearly indicate that routine maintenance and repair of a centrifugal compressor with wet seals does not trigger applicability.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6812, Excerpt 4. The definition of modification is triggered only when a unit is changed in such way as to increase emissions. Therefore, if routine maintenance and repair do not increase emissions, applicability would not be triggered.

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 9

Comment: In addition, the proposed rule is believed to affect small turbo-expanders which Atlas is developing for possible use in upgrading natural gas distribution systems. Published reports state that many of those distribution systems are antiquated and are badly in need of improvements to reduce methane losses. It is plainly in EPA's and the public's interest to frame the rules in such a way that they do not prevent the development of new technology to reduce such methane losses.

Turbo-expanders v. Compressors

A fair reading of EPA's definitions of centrifugal compressors and reciprocating compressors makes clear that equipment used to reduce the pressure on a natural gas or process gas stream is not considered a compressor subject to these rules. Thus, the centrifugal compressor definition

refers to machines of a particular type to raise the pressure of a natural gas, while the reciprocating compressor definition refers to a machine used to raise the pressure of a process gas. Atlas requests express clarification that equipment used to reduce the pressure of a natural gas or process gas stream is not subject to this rule except insofar as they may be subject to leak detection and prevention requirements when used at other regulated installations.

Turbo-expanders are used to reduce the pressure of input natural gas, as is done in gas processing plants as part of the process to separate various natural gas components such as butane, ethane, propane, and methane. At these locations, methane and hydrocarbon emissions are regulated because this equipment is part of a gas processing plant. Moreover, there is usually a flare or process equipment at such plants to combust or use the captured methane.

Atlas Copco is working to develop turbo-expanders for energy recovery in smaller applications and in more dispersed locations than current natural gas processing plants. Thus, for example, a smaller turbo-expander might reasonably be used instead of an expansion valves at the interface between a transmission pipeline and a distribution pipeline. Similarly, a city gateway in the distribution system might be another place a smaller turbo-expander might be used instead of an expansion valve.

The use of small turbo-expanders instead of expansion valves would allow the recovery of waste energy for use in generating electricity or hot water, thereby conserving fuel and reducing emissions. Similarly, turbo-expanders may be used to exploit the pressure differential between high pressure and lower pressure natural gas pipelines in order to liquefy natural gas on a smaller scale than is now done.

Atlas Copco is actively engaged in developing these smaller turbo-expander applications, including some work with U.S. government laboratories. The probable dispersed locations for smaller turbo-expanders are quite different than gas processing plants. At these scattered locations, there is unlikely to be process equipment or flares that can readily use or consume fugitive emissions. By the same token, it would be environmentally beneficial, and reduce methane emissions overall, if current antiquated gas distribution networks could be upgraded and made more efficient.

Given these trade-offs, and the rule's current silence about how small turbo-expanders would be regulated, it would be helpful for the development of these beneficial turbo-expander applications if the final rule expressly excluded turbo-expanders from regulation (other than for leak detection and repair as part of other regulated installations) because they do not increase pressure and are much less likely to release VOCs and methane than the other equipment EPA is regulating in this rulemaking. For such turbo-expander applications, Atlas Copco recommends that the final rule also clarify that methane controls NOT assume the presence of either flares or process equipment to consume fugitive emissions. That clarification may be accomplished by adding a new definition for turbo-expanders, stating that when such equipment is to be used outside of processing plants, such turbo-expanders be considered inherently low polluting if they use seals equivalent to those used in dry seal centrifugal compressors.

Response: In the final rule, the EPA defines Centrifugal Compressor as "any machine for raising the pressure of a natural gas by drawing in low pressure natural gas and discharging significantly higher pressure natural gas by means of mechanical rotating vanes or impellers. Screw, sliding vane, and liquid ring compressors are not centrifugal compressors for the purposes of this subpart." Under the final rule, technologies that meet this definition are centrifugal compressors. However, only wet seal centrifugal compressors are centrifugal compressor affected facilities under the final rule. New, modified, or reconstructed sources that meet these requirements are subject to this final rule.

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 4

Comment: The Agency has wisely decided to make the required controls for methane emitted by compressors substantially the same as the requirements already in place for volatile organic compound (VOC) control for such VOC emissions from oil and gas industry compressors. The VOC requirements were imposed by rule in 2012. EPA took this harmonization step to prevent conflicts from arising between the different regulatory mandates.

According to EPA's September 18, 2015 notice, however, the proposed rule is specifically intended to cover more installations than was true for the 2012 VOC rule. As a result, emissions from wet seal centrifugal compressors used in the natural gas transmission and distribution system are now regulated, when they were not under the 2012 rule. 80 Fed. Reg. 55610.

A careful review of the language in the proposed rule and the proposal notice shows that dry seal centrifugal compressors are not within the scope of this proposed rule. This exclusion occurs because the Agency views such dry seal compressors as inherently low polluting. *Id.*

EPA's proposed definition of "centrifugal compressor" helpfully states that "screw, sliding vane, and liquid ring compressors are not centrifugal compressors for the purpose of this part."

Atlas Copco suggests that a slight revision of the exclusion would improve regulatory clarity. Atlas Copco suggests that this second sentence be changed so that the excluded equipment list would read:

"Screw, sliding vane, liquid ring, and dry seal centrifugal compressors are not centrifugal compressors regulated by this part."

This revised exclusion will make clearer what EPA's definition of "centrifugal compressor affected facility" implies, specifically that dry seal centrifugal compressors are not compressors intended to be regulated under this part since dry seal compressors are inherently low polluting. This nomenclature change will make it easier for manufacturers, operators, and regulators to

focus on the smaller population of wet seal centrifugal compressors for compliance purposes, and the related issues of installation, maintenance, monitoring and control.

Response: The final rule defines centrifugal compressor affected facility as a centrifugal compressor using wet seals. Dry seal centrifugal compressors are not affected facilities under the final rule. We do not agree that any further clarification is needed in the definition of centrifugal compressor.

Commenter Name: C. Wyman
Commenter Affiliation: American Gas Association
Document Control Number: EPA-HQ-OAR-2010-0505-6874
Comment Excerpt Number: 21

Comment: EPA Should Clarify Its Intention To Only Regulate Centrifugal Compressors, Reciprocating Compressors, And Pneumatic Devices At Compressor Stations.

Based on EPA's summary of the proposed rule in the preamble and support documents, AGA believes that EPA only intends to regulate centrifugal compressors, reciprocating compressors, and pneumatic devices at compressor stations. Thus, this equipment located outside of the compressor station fence line, for example at metering stations, would not be affected. However, the applicability sections and definitions in the proposed rule could lead to the conclusion that these equipment types are affected sources in T&S regardless of their location—i.e., not limited to equipment at compressor stations.

AGA encourages EPA revise section 60.5365a as follows so that it is clear that the "affected facility" for this equipment is limited to equipment at compressor stations.

> (b) Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals**, located at a compressor station site as defined in § 60.5430a**. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.
>
> (c) Each reciprocating compressor affected facility, which is a single reciprocating compressor**, located at a compressor station site as defined in § 60.5430a**. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.
>
> (d)(1) Each pneumatic controller affected facility not located at a natural gas processing plant, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh**, located at a compressor station as defined in § 60.5430a**.

If EPA intends for its proposed rule to have broader applicability by including this equipment not located at compressor stations, such as devices at small metering stations, then EPA's supporting analysis justifying its proposed rule is lacking. Additional analysis would be needed to accurately assess the costs and benefits associated with regulating this equipment outside of the compressor station fence line.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6936, Excerpt 18.

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 6

Comment: ***Liquid Natural Gas Installations***

Atlas Copco makes, sells, and services centrifugal compressors used at LNG installations. These centrifugal compressors are used to handle fugitive emissions collected from gas boiling off of the LNG vessels and equipment. The compression allows such captured methane to be used rather than allowed to escape to the atmosphere. These centrifugal compressors work as a form of emissions control, even though the primary motivation for their use is to avoid losing valuable product.

The centrifugal compressors Atlas Copco makes use dry seals in these LNG applications. Atlas suggests that EPA either make the clarification recommended above- making clear that dry seal centrifugal compressors are not addressed by this regulation- or that EPA make clear that it does NOT intend the wet seal standards to apply to compressors used to handle "boil off" gas from LNG installations. The engineering and economic issues at an LNG installation are quite different than what EPA has carefully weighed for the many other installations it has considered in crafting this regulation.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6805, Excerpt 4.

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 7

Comment: ***Natural Gas Fired Electric Power Plants.***

Similar to the LNG situation, Atlas Copco makes, sells and services dry seal centrifugal compressors used at natural gas fired electric generating stations. These are referred to in the product literature as fuel gas boosters.

Once again, Atlas Copco suggests that EPA either make the clarification recommended above- making clear that dry seal centrifugal compressors are not addressed by this regulation- or that EPA make clear that it does NOT intend the wet seal standards to apply to compressors used as fuel gas boosters for electric power generating stations.

The engineering and economic issues at such an electric generating station are quite different than what EPA has carefully weighed for the many other installations it has considered in crafting this regulation. Moreover, those generating stations are already subject to elaborate standards under other provisions of 40 C.F.R. Part 60. Clarity as to which set of rules applies- but not both-- will best serve regulators, operators, and compressor manufacturers.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6805, Excerpt 4.

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 8

Comment: Compressed Natural Gas (CNG) Fueling Stations for Vehicles.

Outside the United States, Atlas Copco makes, sells and services dry seal centrifugal compressors for use in fueling vehicles running on CNG. In a number of foreign locations, CNG is used more widely as a vehicle fuel than it is in the United States. Because of expected revisions in the ozone air quality standard, significant increases in CNG for fleet vehicles should be expected in the many U.S. urban areas which are either in non-attainment for ozone, or are likely to be. The use of CNG is a well-established technique for reducing vehicle emissions as compared to emissions from vehicles powered by gasoline or diesel fuel.

Once again, Atlas Copco suggests that EPA either make the clarification recommended above- making clear that dry seal centrifugal compressors are not addressed by this regulation- or that EPA make clear that it does NOT intend the wet seal standards to apply to compressors used in CNG fueling stations for vehicles.

The Clean Air Act has elaborate rules governing emissions from vehicle refueling, rules which seek to strike a balance between the equipment used onboard vehicles to control such emissions and the equipment used at the "pump" or fueling station. Those vehicle fueling rules were not the focus of this rulemaking. EPA should clarify that methane emissions from CNG fueling will be separately addressed, and that the emission requirements for wet seal compressors do not apply to the compressors used at CNG refueling stations.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6805, Excerpt 4. The EPA also notes that if a CNG refueling station is located within the Oil and Natural Gas Source Category as defined in 60.5430a, then new, modified, or reconstructed wet seal compressors are centrifugal compressor affected facilities under the final rule.

Commenter Name: Anthony Pocengal
Commenter Affiliation: Solar Turbines Incorporated
Document Control Number: EPA-HQ-OAR-2010-0505-6812
Comment Excerpt Number: 8

Comment: 60.5410a(b)(2) – Demonstration of 95.0% VOC Reduction when 'Routing to Process'

Note that the last sentence of this paragraph only refers to VOC and not methane. With pipeline quality natural gas, VOC represents a very small portion of the gas composition – usually around 1% by volume. In such cases, which would apply particularly to the mid and downstream segments of the industry, a 95.0% reduction in VOC will represent a very small, insignificant volume. EPA should only apply this VOC reduction requirement to facilities which handle gas with a minimum VOC content of perhaps 10% by volume and/or exempting the mid and downstream sectors (and other facilities which handle pipeline quality gas) from this requirement. Alternatively, EPA should consider replacing 'VOC' in the last sentence of this paragraph with 'methane.' Replacing 'VOC' with 'methane' here seems to be more appropriate and logical for the purpose of attaining meaningful hydrocarbon emissions.

Response: The EPA appreciates the commenter's identifying this oversight in the regulation. The EPA has revised the language in §60.5410a(b)(2) to address this issue.

Commenter Name: Anthony Pocengal
Commenter Affiliation: Solar Turbines Incorporated
Document Control Number: EPA-HQ-OAR-2010-0505-6812
Comment Excerpt Number: 6

Comment: 60.5380a(a)(1) – 95.0% Reduction of VOC and Methane

EPA cites a factor of 6 scfm in section VIII.B of the Preamble as an estimate for emissions from dry seal systems. Since a wide variety of wet seal systems are in use with varying rates of de-gas emissions, EPA should consider adding a condition in this paragraph stipulating that if a wet seal system can meet an emissions performance specification on par with dry seals (e.g., 6 scfm) such wet seal systems should be exempted from the 95.0% control or any other requirements. A model or engineering/design analysis should be allowed to demonstrate compliance with the performance specification as physical measurements may be inherently unsafe and/or impractical to execute – similar to Comment 1 below for 60.5410a(a).

Response: The BSER analysis establishing the emission reduction standard for centrifugal compressor affected facilities used an average emissions factor derived from the best available data for emissions from these sources. As such the average takes into consideration that there may be wet seal compressors in use in the industry that have lower and higher than the average

emissions levels. We do not have data that identifies a specific type, size, brand, or other criteria by which to identify these low-emitting compressors referenced by the commenter.

Commenter Name: Anthony Pocengal
Commenter Affiliation: Solar Turbines Incorporated
Document Control Number: EPA-HQ-OAR-2010-0505-6812
Comment Excerpt Number: 7

Comment: 60.5410a(b)(2) – Demonstration of 95.0% VOC Reduction when 'Routing to Process'

The insertion of the 'route to process' pathway for compliance is an improvement and logical addition to the original OOOO rule. Since it is highly likely that physical measurements to prove the 95.0% reduction will be impossible when routing the degas emissions to a process, a model or engineering/design analysis should be allowed to prove compliance, as applicable.

Response: The final rule does not require a specific demonstration of 95 percent reduction for units that are routed to a process. For the routing to process option, only the closed vent system compliance requirements apply.

Commenter Name: Howard J Feldman
Commenter Affiliation: American Petroleum Institute
Document Control Number: EPA-HQ-OAR-2010-0505-6884
Comment Excerpt Number: 36

Comment: The Compliance Assurance Requirements For Centrifugal Compressors Are Not Justified

During discussions with EPA, API was told that the control device monitoring and testing requirements of the 2012 rule were retained since few centrifugal compressors were expected to require control and that most of these affected sources would be located at more developed facilities, such as Natural Gas Processing Plants. While this statement may sufficiently explain the retention of some of the monitoring provisions, it does not address the practical considerations in complying with the performance test provisions and the identifying parameter ranges required for the continuous monitoring. Although there are a few centrifugal compressors that require control, almost all of the control devices also control gases from other sources, such as storage vessels, that bring in the impracticality of flow measurement discussed in Section 12.1.3.

Response: We believe that the emission reductions that would be achieved through control of centrifugal compressor emissions justify the need for compliance assurance requirements

consistent with those for centrifugal compressors at processing plants. See response to DCN EPA-HQ-OAR-2010-0505-6884, Excerpt 32 (Chapter 11.7 Other Comments).

Commenter Name: Kathleen M. Sgamma, Vice President, Government and Public Affairs
Commenter Affiliation: Western Energy Alliance
Document Control Number: EPA-HQ-OAR-2010-0505-6930
Comment Excerpt Number: 55

Comment: *Staggered annual reporting for compressors is overly burdensome on operators.* The Alliance proposes the rule set an annual reporting date for all applicable sources subject to NSPS OOOO and OOOOa (e.g., September 30th every year, or within 90 days of the end of the year, etc.). Based on our members' past experience complying with NSPS OOOO, annual reporting is very burdensome; especially so for operators with many compressors, each with varying initial startup dates, requiring individual tracking and reporting under the proposed rule.

Response: The rule requires an annual report by owner/operator, not by individual affected facility. Therefore, the owner/operator must submit the initial annual report for an affected facility within 90 days of the end of the initial compliance period for the affected facility. However, because subsequent reports can be submitted at any during the following year, the owner/operator can choose when to submit one annual report for all affected facilities provided it falls within the timeframes outlined in the rule.

Commenter Name: C. Wyman
Commenter Affiliation: American Gas Association
Document Control Number: EPA-HQ-OAR-2010-0505-6874
Comment Excerpt Number: 14

Comment: <u>EPA Should Consider Emissions Information Reported Under Subpart W Of The GHGRP In Its Analysis And When Considering Whether Regulation Is Warranted.</u>

As EPA recognizes, the Agency is collecting data from T&S compressor stations under Subpart W of the GHGRP, which requires annual leak surveys and compressor vent measurements for T&S compressor stations. Since 2011, thousands of measurements have been completed and reported to EPA. Because an objective of the GHGRP is to inform policy decisions, EPA should closely review Subpart W reported data to understand implications for this initial regulation of methane emissions from natural gas operations. Although Subpart W only captures a subset of compressor station facilities, emissions can still be compared to EPA historical estimates by comparing on a common "activity data" basis. In other words, because EPA estimates for T&S in the annual national GHG inventory are often based on facility counts or compressor counts, comparisons of historical estimates could be made against emissions per facility or emissions per compressor values. A cursory review of the data indicates as follows:

- Focusing on "gross emitters" is warranted because a small number of measured leaks are responsible for the majority of compressor station leak emissions.
- Emissions from centrifugal turbines with wet seal degassing vents are significantly less than EPA's national inventory estimate.
- Pneumatic controller emissions for T&S are lower than EPA's national inventory estimate.

The first item supports focusing on gross emitters and considering alternatives such as DI&M, as AGA proposes above. The emission estimates for two affected sources – centrifugal compressors with wet seals and pneumatic devices – raise questions about the potential environmental benefit and the need for the proposed regulation. AGA recommends that EPA closely review emissions data from Subpart W and revisit its cost-benefit analysis in the Technical Support Document (TSD) based on more current emission estimates.

Response: As the commenter notes, transmission and storage pneumatic controller emissions in the GHG inventory published in 2015 were higher than in GHGRP. Both the proposal and the final rule used emission factors from the GHGRP, and not the GHG Inventory. The GHG Inventory has recently been updated to use GHGRP data.

Regarding wet seal centrifugal compressors, see response to DCN EPA-HQ-OAR-2010-0505-6872, Excerpt 38.

Regarding gross emitters, see response to DCN EPA-HQ-OAR-2010-0505-6811, Excerpt 18 (in Chapter 4 of this document).

Commenter Name: Russell V. Randle
Commenter Affiliation: Atlas Copco North America LLC
Document Control Number: EPA-HQ-OAR-2010-0505-6805
Comment Excerpt Number: 10

Comment: ***Clarifications Are Needed Concerning Emissions During Compressor Maintenance and Repair Operations during Startup, Shutdown and Malfunction (SSM) Events.***

The Proposed Rule makes clear that the general provisions exempting equipment from compliance during periods of startup, shutdown, or malfunction (SSM) at 40 C.F.R. § 60.8(c) do not apply to new Subpart OOOOa. See 80 Fed. Reg. 56,665, proposed 40 C.F.R. § 60.5370a(b). As a result, the proposed emission standards apply even during SSM events. The Agency has an obligation to consider the effect of SSM events when setting the proposed technology-based emission standards so that there is a reasonable way to stay in compliance during SSM events. *See* 42 U.S.C. § 7411(a)(1) (requiring that standards of performance be "achievable" based on controls that have been "adequately demonstrated"); *Essex Chern. Corp. v. Ruckelshaus,* 486 F.2d 427, 433 (D.C. Cir. 1973). Atlas Copco asks, therefore, that the Agency establish in the

rulemaking record its basis for determining that the standards are reasonably achievable during SSM events.

Atlas Copco is specifically concerned with this demonstration for compressor applications covered by the Proposed Rule. For instance, EPA should demonstrate in the record that the obligation to reduce methane and VOC emissions from each centrifugal compressor wet seal fluid degassing system by 95.0 percent or greater is achievable during SSM events. It is not clear from this record that such standards can be met during such events.

The performance testing requirements for establishing initial compliance at 40 C.F.R. § 60.5413a do not appear to address SSM events. This is reasonable since performance tests are typically conducted during normal operating conditions to provide a snapshot of compliant operation that excludes SSM events. However, the continuous compliance demonstration at 40 C.F.R. § 60.5415a requires that each control device establish an operating parameter during the performance test and then demonstrate compliance with that operating parameter at all times.

The Proposed Rule would apply an operating parameter established during periods of normal operation to determine compliance during SSM events. In this situation, the performance test cannot establish the necessary correlation between the operating parameter and the SSM event for it to be relevant to determine continuous compliance. Therefore, the Agency should establish a separate continuous compliance demonstration for SSM events.

One reasonable approach to incorporating SSM events into the continuous compliance demonstration is to use averaging periods that are substantially longer than the anticipated duration of an SSM event. The Agency proposes a daily average for the operating parameters set by performance test. See 40 C.F.R. § 60.5415a(b)(2).

Unfortunately, this daily average is an insufficient averaging period to accommodate the variability added by SSM events. These events may result in higher discharge rates for a few minutes up to a few hours, but their occurrence is very rare. EPA should consider using an annual averaging period as it uses in other parts of this rule. For example, the continuous compliance demonstration when using a condenser as the control device is based on outlet temperature as the operating parameter. This outlet temperature is used in conjunction with a condenser performance curve to determine daily average TOC emission reductions. The rolling 365-day average is then used to determine compliance.

Using this extended annual averaging period could help demonstrate that a small number of SSM events will not violate the rule even if such rare events temporarily result higher methane emissions for short periods of time. Using the annual approach means that the long normal operating periods outweigh these temporary problems over the course of an entire year. Particularly where methane and global warming concerns are EPA's motivation for the rule, the Agency should be more willingness to use an annual average, since the total mass of such emission over time is the primary concern, not temporary ground level concentrations.

Compressors may malfunction in ways that require the evacuation of methane and VOC to ensure system and operator safety. These malfunctions are rare but not always preventable. After

a malfunction and prior to maintenance, it may be necessary to dissemble the piping connected to the compressor. To ensure a safe working environment, the natural gas between the inlet and discharge block valves must be flushed out. The volume to be flushed out includes a few diameters of pipe prior to the compressor, the compressor housing[s], any inter-stage pipe, any gas coolers, and a few diameters of pipe following the compressor discharge. Such disassembly is very rare, typically less than once per year.

Operators should not be forced to choose between complying with the rule and safety. As such, the rule should expressly accommodate such malfunctions into the rule by (1) extending averaging periods sufficiently to accommodate SSM events; (2) by establishing a separate standard or work practice that will apply to SSM events; or (3) setting standards for which there is a pathway to compliance during all foreseeable operating conditions including SSM events.

The standard for reciprocating compressors is a good example of a standard that can apply at all times, including SSM events. Reciprocating compressors demonstrate compliance by replacing the rod packing within an established period of time or number of operating hours. This standard is not affected by malfunctions or startup and shutdown events. Therefore, this standard provides a clear pathway to compliance for both normal and SSM operating conditions.

Response: The rule requires compliance with all requirements during SSM events. The compliance assurance requirements apply to control devices.

7.5 Reciprocating Compressors - Support for Proposed Standard

Commenter Name: Lee Fuller, Executive Vice President, and V. Bruce Thompson, President
Commenter Affiliation: Independent Petroleum Association of America (IPAA) and the American Exploration and Production Council (AXPC)
Document Control Number: EPA-HQ-OAR-2010-0505-6983
Comment Excerpt Number: 50

Comment: IPAA/AXPC supports EPA's indication that the compressor rules promulgated under Subpart OOOO and proposed Subpart OOOOa do not apply to compressors at the wellsite.

Response: Comment is a supportive comment to which no response is required.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:10 AM - 8:00 PM; Public Hearing #1 - Dallas, Texas
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 201

Comment: Storage tanks and compressors at well sites should be included in the rule.

Response: See response to DCN EPA-HQ-OAR-2010-0505-7336, Excerpt 211.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:10 AM - 8:00 PM; Public Hearing #1 - Dallas, Texas
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 211

Comment: I also ask you to extend the regulations to compressors and well sites.

Response: See the preamble to the final rule, section VIII.C.2 for more information on the well site compressor exemption.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 2:40 PM; Public Hearing #2 - Dallas, Texas
Commenter Affiliation: None

Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 65

Comment: And then also, cover compressors and compressor stations, making sure that those are regulated.

Response: Centrifugal and reciprocating compressors are regulated at all locations except at well sites. Compressor stations are regulated under fugitive emissions standards.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:00 AM - 2:40 PM; Public Hearing #2 - Dallas, Texas
Commenter Affiliation: None
Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 110

Comment: I mean, it's really interesting that, you know, you will regulate a compressor that's on its own, stands alone, but not one that's right there on the pad site. I think that, you know, all compressor stations need to be regulated. Because, I mean, they are some of the worse emitters of toxic acids.

Response: See response to DCN EPA-HQ-OAR-2010-0505-7336, Excerpt 211.

Commenter Name: Michael J. Meyers, et al., Assistant Attorneys General
Commenter Affiliation: Attorneys Generals of New York, Massachusetts, Oregon, Rhode Island, and Vermont (States)
Document Control Number: EPA-HQ-OAR-2010-0505-6940
Comment Excerpt Number: 9

Comment: The Proposed Standards for Compressors and Pneumatic Devices are Technically Achievable and Cost Effective. The Proposed Rule demonstrates that methane can be significantly and cost effectively reduced by establishing emission standards for methane from compressors and pneumatic devices. Centrifugal compressor emissions may be cost effectively controlled by installation of a capture and combustion device on wet seal compressors, while reciprocating compressor emissions may be controlled by the periodic replacement of rod packing systems. 80 Fed. Reg. at 56,619-21. Pneumatic controller emissions can be significantly reduced by replacing high-bleed controllers with either low-bleed or zero-bleed controllers. Methane emissions from pneumatic pumps can be cut in many instances by replacing the pumps at natural gas processing plants with instrument air pumps, and by routing emissions from pumps in the production, transmission, and storage segments to an existing control device or a process. Id. at 56,623-27. These findings are consistent with previous EPA determinations concerning this equipment and in other studies. See, e.g., Compressors White Paper at 43; Pneumatic Devices

White Paper at 56-57; U.S. Envtl. Prot. Agency, Reducing Methane Emissions from Compressor Rod Packing Systems 1 (2006) (indicating payback periods from one to three months for compressor maintenance activities that reduce methane emissions); WRI Clearing the Air Report at 6 (replacing existing high-bleed pneumatic devices with low-bleed equivalents throughout natural gas system identified as one of three strategies that could cost-effectively cut methane emissions by thirty percent); Natural Res. Def. Council, Leaking Profits: The Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste 1 (2012) [hereinafter NRDC Leaking Profits Report] (identifying improved maintenance of reciprocating compressors and replacement of high-bleed pneumatic controllers with low-bleed or zero-bleed controllers as two of ten cost-effective strategies that could reduce methane emissions from the oil and gas sector by eighty percent).

Response: Comment is a supportive comment to which no response is required. We have finalized the proposed NSPS standards for compressors and pneumatic controllers in the final rule.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 7

Comment: Compressor are likewise a potentially significant source of emissions, and we recommend EPA:

- Reciprocating Compressors. Require operators to capture emissions from each reciprocating compressor rod packing by using an emissions collection system; or alternatively, to adopt a measurement-based threshold to determine when operators must replace rod-packing systems.

Response: Our analysis for reciprocating compressors determined that BSER is the replacement of rod packaging per the proposed work practice standard. We do not have data on which to base a measurement-based threshold that would trigger rod packing replacement. Commenters suggest that the EPA require the capture of emissions from each reciprocating compressor rod packing by using an emissions collection system. While we agree that this could possibly result in emission reductions, the commenter does not indicate to where those emissions would be routed and we do not have data in the record to support this kind of methodology as BSER for reciprocating compressors.

Commenter Name: Public Hearing Comments On Proposed Climate, Air Quality, and Permitting Rules for the Oil and Natural Gas Industry; Wednesday, September 23, 2015; 9:10 AM - 8:00 PM; Public Hearing #1 - Dallas, Texas
Commenter Affiliation: None

Document Control Number: EPA-HQ-OAR-2010-0505-7336
Comment Excerpt Number: 3

Comment: Another thing that was brought up earlier by Sharon Wilson is the compressors and compressor stations. Once the oil rig, the gas drilling rig, has come and gone, these compressors are a major permitted source of air pollution and methane pollution; and so for the rules not to cover them again for people that live with this on a daily basis, it seems ridiculous. Why even bother if you're not going to cover one of the largest permitted sources of air pollution from this industry?

Response: See the responses to DCN EPA-HQ-OAR-2010-0505-7336, Excerpt 65 and DCN EPA-HQ-OAR-2010-0505-7336, Excerpt 211.

Commenter Name: Gary Buchler
Commenter Affiliation: Kinder Morgan, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6857
Comment Excerpt Number: 29

Comment: EPA proposes an operational standard that requires either replacement of rod packing every 26,000 hours (or every 36 months in lieu of monitoring compressor operating hours, at operator's election), or routing of rod packing emissions to a process via a closed vent system under negative pressure. Based on an evaluation of its operations and the cost-effectiveness of the same, Kinder Morgan supports replacement of rod-packing every 26,000 hours or every 36 months, at operator's election.

Response: Comment is a supportive comment to which no response is required.

7.6 Reciprocating Compressors – Best System of Emission Reduction

Commenter Name: Dan Hannon, Senior Applications Engineer
Commenter Affiliation: Ariel Corporation
Document Control Number: EPA-HQ-OAR-2010-0505-6749
Comment Excerpt Number: 3

Comment: Though changes are not proposed to the specific paragraphs for the reciprocating compressor piston rod packing sealing, the comments to Subpart OOOOa can be applied to Subpart OOOO.

60.5385a: What methane and VOC standards apply to reciprocating compressor affected facilities?

(a) (1) and (2) With the newer packing seal technology, and with the variety of operating conditions, operating speeds, operating temperatures, packing seal life varies from unit to unit. Packing seal life has been seen to exceed 26,000 hours (or 36 months) prior to reaching a level of leakage that would warrant the replacement of the rings. However, not all installations measure leakage rates. It may make sense to offer the choice between hours, months, or average leakage rate across the throws on a single compressor.

(a) (3) I understand the allowance for (3) originally comes from a specific collection method for re-use of the gas in an engine intake system, allowing a gentle negative pressure at the packing vent. However, allowing a negative pressure collection system outside of the engine intake system may result in a strong negative pressure. If the collection system is via a vent recovery compressor, a strong negative pressure may draw air into the vent system, and have possible combustion concerns. If a minimal positive pressure of no more than 15 psig (1 barg) were allowed, it would offer other collection facilities to be employed, such as recovery to a lower pressure inlet pipe, or recompression to the gas system. There is one final seal set in the packing seal downstream of the packing vent which can be very effective against smaller positive pressures.

Response: The EPA does not agree with the commenter that we should include an average leak rate across the throws as an option under the final rule. We do not have sufficient data to determine what an appropriate leak rate threshold would be and therefore, we cannot consider this type of option in setting BSER for reciprocating compressors. The EPA appreciates the information provided by the commenter with respect to routing compressor emissions to a process. We note that this has been provided in the rule as an alternative at the operator's discretion, and would not be applicable in all circumstances.

Commenter Name: John Hampp
Commenter Affiliation: NextEra Energy, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6873
Comment Excerpt Number: 14

Comment: EPA should allow the flexibility for sources to utilize either of the two (2) options in the rule for replacing rod packing regardless of which may occur first. A compressor station may experience minimal runtime hours due to operating conditions that would not warrant the demand. Rod packing replacement has been estimated at approximately $14,000 per compressor where conducting a replacement every 36 months would lead to unreasonable expense for prevention of leak occurrences that would not be anticipated to occur. It would further require the additional cost for procurement of contract labor to perform the replacement due to limited internal resources available. EPA should allow sources to choose compliance with the 26,000 hours of operation runtime frequency instead of replacement every 36 months based on use. Alternatively, EPA could establish a sub-category in the final rule for "limited-use" reciprocating compressors that would accomplish similar flexibility by allowing compressors with minimal runtime hours to comply with the 26,000 hours of operation rod packing replacement option only.

While incorporating the physical ability to re-route emissions from the rod packing via a closed vent system for reuse or recycling can be worked into a newly constructed source, an "existing" facility that undergoes a "modification" would require detailed engineering and field modifications. As aforementioned, a compressor station at an existing facility may typically experience very minimal runtime hours due to operating conditions that do not warrant demand. EPA should specifically not require existing facilities that are "modified" to be burdened with re-engineering.

Response: The final rule provides the owner/operator with the discretion to choose between replacing the rod packing on or before 26,000 hours of operation runtime or at or before 36 months. The third option is to route emissions to a process, and the EPA notes that this alternative will not be feasible in all circumstances.

Commenter Name: Jack Schwaller
Commenter Affiliation: HOERBIGER Corporation of America, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6799
Comment Excerpt Number: 5

Comment: <u>Regulation Challenge</u> Maximum allowable time to replace should be based on sealing performance: 36 months or 26,000 hours too short for some applications. Seal change-outs should be based on high leakage rate only.

1. **<u>Problem</u>** – many pipeline applications, the pressure differential is low, thus wear rates of the rings and their counter-surfaces are also low, allowing for extended life
    1. User maintenance goals are to maximize run time between repairs.

2. Curbs use of new technology enhancements….not needed

2. **Benefits to increase time**
    1. Reduce maintenance costs
    2. Increases unit availability

Response: We based the requirements for rod packing replacement frequency on an average of data from studies on emissions reduction options for reciprocating compressors as outlined in the TSD for the final rule. Because we use an average for the analysis, some compressors will require replacement prior to reaching the wear rate and related leak rates on which the rule was based.

Commenter Name: Howard J Feldman
Commenter Affiliation: American Petroleum Institute
Document Control Number: EPA-HQ-OAR-2010-0505-6884
Comment Excerpt Number: 68

Comment: Negative Pressure Requirement On Routing Reciprocating Rod Packing Emissions Back To Process Is Flawed And Should Be Amended Relative To Operating Pressure – Not Relative To Atmosphere.

The requirements in §60.5385(a)(3) and §60.5385a(a)(3) that require the collection of emissions from the rod packing under negative pressure is technically flawed where EPA states the following:

"Collect the emissions from the rod packing using a rod packing emissions collection system which operates under negative pressure and route the rod packing emissions to a process through a closed vent system..."

Operating a crankcase collection system under a negative pressure (vacuum) leads to significant safety issues with the possibility of oxygen being introduced into the system.

Therefore, API recommends the language be amended in in §60.5385(a)(3) and §60.5385a(a)(3) to the following:

"Collect the emissions from the rod packing using a rod packing emissions collection system ~~which operates under negative pressure~~ and route the rod packing emissions to a process through a closed vent system..."

Response: The EPA believes that operation of the collection system under negative pressure is necessary to appropriately capture emissions and therefore is not adopting API's recommended language.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 93

Comment: Again, while EPA has identified effective methods for reducing reciprocating compressor emissions—periodic rod packing replacements and the use of rod packing emissions collection systems—we propose several structural and substantive changes to these standards to ensure they reflect BSER.

First, the agency should prioritize the use of rod packing emissions collection systems over periodic rod packing replacements, but require both if feasible. Even newly installed rod packing typically leaks some gas, and these leaks increase as the packing wear down over time. Under EPA's proposed standards, operators opting to replace rod packing every 26,000 hours / 3 years will typically vent this gas to the atmosphere. Replacing an old set of rod packing with a new set certainly reduces the increased emissions that occur as a result of wear and tear, but even the new packing will allow some emissions, and the aggregated sum of emissions over the course of the lifetime of the packing can be significant. A compressor rod packing system with new and well-functioning packing emits approximately 11-12 scfh. This translates to nearly 2 tons of methane per year per compressor cylinder. On the other hand, a collection system can eliminate nearly all of the emissions associated with rod packing in reciprocating compressors. For example, REM Technology's SlipStream® system integrates additional equipment into compressors that captures gas that would otherwise have been vented from rod packing and routes that gas back to the compressor's engine for use as combustible fuel. Field test results indicate that SlipStream technology can reduce methane emissions from compressor rod packing by 95 percent and VOC and HAP emissions by 99 percent. The use of this or similar technologies will result in methane emissions that are consistently well below the 2 tons of methane per year associated with a "well functioning" rod packing system, let alone the emissions from a rod packing system as it approaches the latter part of the three-year period EPA's proposal would allow operators between packing replacements. And, at most sites, as discussed above for centrifugal compressors, there will be other options to utilize this gas, such as directing it to a VRU or using it as a portion of the fuel gas for equipment (such as heaters and re-boilers) on site.

Importantly, both California and Ohio are considering requirements that prioritize rod packing emissions collection systems over periodic rod packing replacements. ARB's draft proposal gives operators the choice of either capturing emissions from each compressor via a vapor collection system, or regularly monitoring and repairing or removing from service compressors with excessive rod packing emissions. The Ohio EPA similarly recently released a draft general permit that requires operators capture 100% of gaseous emissions from reciprocating compressor rod packing seals and control such emissions by routing emissions to a pipeline, fuel gas system or a flare designed for 98% destruction.

Notably, section 111 of the Clean Air Act requires EPA to take into account and spur technological innovation in developing performance standards. See, e.g., *Sierra Club v. Costle*, 657 F.2d 298, 346 n.174 (D.C. Cir. 1981) ("[S]ection 111 was intended 'to assure the use of available technology and to stimulate the development of new technology.'" (quoting S. Rep.

No. 95-127, at 114 (1977)). By prioritizing the use of available technology such as SlipStream and other vapor recovery methods, EPA will fulfill this statutory mandate under section 111.

EPA should therefore include regulatory text in the final rule specifying that operators should, as a required first option, use an emissions collection system to capture gas from reciprocating compressor rod packing and direct it to a process.

While it should generally be feasible to route the gas from most reciprocating compressors to a process, as described above, if a source operator cannot install an emissions collection system or vapor recovery unit for a specific reason, we agree that periodic rod packing replacements are an important secondary approach to prevent wasteful and environmentally damaging emissions.

However, EPA's current proposal would require rod packing replacements after certain fixed periods of time (every 26,000 operating hours or every 36 calendar months). The problem with this approach is that rod packing emissions can often grow quite high before the compressor has been operated for 26,000 hours. Indeed, it will often be cost-effective, or even profitable for operators, to reduce emissions by replacing rod-packing before this fixed operation interval has passed. Rather than establish a replacement schedule based on fixed temporal increments, EPA should require operators of reciprocal compressors to measure their emissions and replace their rod packing systems whenever those emissions exceed specific limits.

ARB's draft regulations for oil and gas sector methane emissions are instructive. As noted above, per the proposal operators may either capture emissions from each compressor via a vapor collection system, or regularly monitor and repair or remove from service compressors with excessive rod packing emissions. For larger compressors, direct measurement of the volumetric emission rate is required. ARB's proposal requires replacement or repair of rod packing seals whenever emissions exceed certain specified thresholds. This approach helps to ensure that it is the quantity of emissions, not the increment of time that has passed, that determines when an operator must take action. It not only offers a more effective method for reducing emissions, but also one that will generate more granular emissions data that will assist EPA in future decision- making.

An emissions-based (rather than purely temporal) approach to rod packing replacement would require EPA to establish the threshold at which rod packing replacements are required. In its Natural Gas STAR literature, EPA provides operators with a method for determining a threshold above which replacing rod packing would be more cost-effective than sacrificing the emissions from worn-out packing. The agency notes that,

A new packing system, properly aligned and fitted, may lose approximately 11 to 12 standard cubic feet per hour (scfh) . . . Under the best conditions, new packing systems properly installed on a smooth, well-aligned shaft can be expected to leak a minimum of 11.5 scfh.

Response: The EPA has determined BSER to be replacement of rod packing based on the operational frequency outlined in the final rule. We received comment on the proposal for the subpart OOOO standard in 2011 that operators would also be able to capture and route these emissions to a process. We believe that this option will provide the same level of emission

reductions as the requirement for rod packing replacement, and therefore, provided this option in the rule.

Commenter Name: Jack Schwaller
Commenter Affiliation: HOERBIGER Corporation of America, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6799
Comment Excerpt Number: 2

Comment: Regulation addition: Need for establishing acceptable rod packing emissions levels. Current requirement calls for a maintenance regiment to insure reduced leakages and then a monitoring to identify gross seal failure. This is certainly an acceptable approach and will contribute to site reductions.

We assume that integration of the Subpart W will follow calling for field measurement collection. *When integrated, wording that sets limits would assist some users in their individual pursuit for continuous improvements of leak reduction.*

Benefits of stating limits

1. Identifying real total leakage at a given site that includes recips already required for some sites (some states and permitted sites).
2. Offers industry standards for comparison.
3. Will be helpful for companies involved with voluntary and carbon credit programs.

Problems and Solutions:

1. Acceptable levels will vary unit to unit, site to site. Allowable "not to exceed" limits can be established based on number of throws, rod size and pressure.
2. A company can set those target limits.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6749, Excerpt 3.

Commenter Name: Jack Schwaller
Commenter Affiliation: HOERBIGER Corporation of America, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6799
Comment Excerpt Number: 6

Comment: Regulation Challenge: Definition of "rod packing" needs to be more specific. Loose definition could mean just changing out the rings or it might be replacing entire case assembly.

1. **Problem** - the leak will return sooner if just the rings are replaced. The cups need to be at least inspected and reconditioned if necessary.
2. **Solution:** more direct definition for "packing" in the definitions section. Packing is defined as "the entire sealing assembly or any part of that assembly that can reduce leakage to an acceptable level and achieve required run time between repairs".

Response: See section VI.B of the preamble to the final rule for a discussion of this issue.

Commenter Name: Jack Schwaller
Commenter Affiliation: HOERBIGER Corporation of America, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6799
Comment Excerpt Number: 11

Comment: Regulation Challenge: No reference to "standby leakage": conventional packing leaks when unit is shut down but cylinders are pressurized. Leakage rates can be high.

1. **Solution:** Identify those locations with those conditions and install an improved sealing system that properly seals, regardless of unit condition.
2. **Benefit:**
    1. Can reduce blowdowns in some situations
    2. Will back-up leaking yard valves that continuously pressurize a blown down cylinder. This causes continued gas venting to atmosphere.
    3. A major saving of lost gas.

Response: The EPA has determined BSER to be replacement of rod packing at intervals outlined in the rule to minimize leakage based on wear and degradation of rod sealing systems. Therefore, leakage of the unit during standby or operational mode is addressed under the requirements.

Commenter Name: Rodney Sartor
Commenter Affiliation: Enterprise Products Partners L.P.
Document Control Number: EPA-HQ-OAR-2010-0505-6807
Comment Excerpt Number: 10

Comment: The proposed NSPS imposes the same requirements for reciprocating compressors regulated under Subpart OOOO in the gathering and boosting stations, and natural gas processing plants, on reciprocating compressors within the transmission and storage segment. We believe that these additional controls for the storage and transmission sector are unjustified and unnecessary because these compressors do not meaningfully contribute to the emission of VOCs or methane, and the compliance costs associated with these regulations cannot be justified by the minute reductions in emissions that would result. Instead, the midstream industry should be allowed to use voluntary condition-based maintenance strategies to ensure that these compressors are properly operating. EPA has estimated an annualized cost of around $2,000 per

unit for reciprocating compressors in the transmission and storage sector to comply with the NSPS.

Response: The EPA has analyzed emissions and emission reduction potential for reciprocating compressors in the transmission and storage segment and found that the emissions are sufficient to warrant regulation. The annualized cost stated by the commenter is correct with the resulting cost of control of $81 per ton of methane in the transmission and $95 per ton of methane in storage. Please see the TSD to the proposal and final rule for additional information.

Commenter Name: Darin Schroeder, David McCabe, Lesley Fleishman and Conrad Schneider
Commenter Affiliation: Clean Air Task Force et al.
Document Control Number: EPA-HQ-OAR-2010-0505-7062
Comment Excerpt Number: 94

Comment: Second, EPA provides a formula to determine the emissions threshold above which rod packing replacements become profitable for operators: The discount factor, in turn, is defined as:

[Formula for economic replacement threshold shown along with the discount factor formula]

Where i equals the discount rate expressed as a decimal and n equals the payback period selected. In 2006, EPA reported the costs of replacing a rod packing system as $1,620 per cylinder; adjusted to 2015 dollars, that figure is $2,049 per cylinder. EPA also suggests 8,000 hours of annual operation time in its Natural Gas STAR report.

The calculation for economic replacement threshold can be adapted to calculate the net cost, including the savings from capturing gas that would otherwise be vented, of a standard that would require the replacement of rod packing when emissions from a cylinder reach a certain threshold. EPA must design its emissions threshold for rod packing replacements with the environmental benefits as the foremost consideration. As the threshold increases, both environmental benefits and economic costs decrease. Using standard values in addition to those mentioned above, Table 12 shows net abatement costs associated with several replacement thresholds that we considered. Based on these results, and compared to the abatement cost for EPA's entire proposal of $980 per short ton, we conclude that a standard which requires replacement of rod packing when emissions from a cylinder reach 20 to 25 scfh would be reasonable.

[Table 12: Abatement Costs Associated with Rod Packing Replacement Thresholds]

For context on the suggested replacement threshold between 20 and 25 scfh per rod packing, consider the distribution of emissions reported by Carbon Limits, based on a database comprised of records from direct measurements of 2,361 compressor cylinders. Carbon Limits report that approximately 72 percent of rod packings in the field at any given time emit between 0 and 20 scfh, about 12 percent emit between 20 and 40 scfh, and 15 percent emit greater than 40 scfh.

Response: Commenter provides analysis and input on the development of an emission or leak rate threshold for replacement of rod packing. We have based the requirements in the final rule on the best available emission data related to the control technology of replacing rod packing. We do not have sufficient data in order to establish what would be an appropriate threshold for such an emission-based threshold provision.

Commenter Name: C. Wyman
Commenter Affiliation: American Gas Association
Document Control Number: EPA-HQ-OAR-2010-0505-6874
Comment Excerpt Number: 22

Comment: EPA Should Clarify Its Intention To Only Regulate Centrifugal Compressors, Reciprocating Compressors, And Pneumatic Devices At Compressor Stations.

Based on EPA's summary of the proposed rule in the preamble and support documents, AGA believes that EPA only intends to regulate centrifugal compressors, reciprocating compressors, and pneumatic devices at compressor stations. Thus, this equipment located outside of the compressor station fence line, for example at metering stations, would not be affected. However, the applicability sections and definitions in the proposed rule could lead to the conclusion that these equipment types are affected sources in T&S regardless of their location—i.e., not limited to equipment at compressor stations.

AGA encourages EPA revise section 60.5365a as follows so that it is clear that the "affected facility" for this equipment is limited to equipment at compressor stations.

> (b) Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals**, located at a compressor station site as defined in § 60.5430a**. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.
>
> (c) Each reciprocating compressor affected facility, which is a single reciprocating compressor**, located at a compressor station site as defined in § 60.5430a**. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.
>
> (d)(1) Each pneumatic controller affected facility not located at a natural gas processing plant, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh**, located at a compressor station as defined in § 60.5430a**.

If EPA intends for its proposed rule to have broader applicability by including this equipment not located at compressor stations, such as devices at small metering stations, then EPA's supporting

analysis justifying its proposed rule is lacking. Additional analysis would be needed to accurately assess the costs and benefits associated with regulating this equipment outside of the compressor station fence line.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6936, Excerpt 18.

7.7 Reciprocating Compressors - Alternative Control Options

Commenter Name: Theresa Pugh
Commenter Affiliation: Interstate Natural Gas Association of America (INGAA)
Document Control Number: EPA-HQ-OAR-2010-0505-6872
Comment Excerpt Number: 27

Comment: For Reciprocating Compressors, Condition-Based Maintenance Should Be Included as an Alternative to Prescribed Maintenance Intervals.

INGAA's comments have addressed rod packing elsewhere, but INGAA wishes to make some technical suggestions to address maintenance schedules. For reciprocating compressor rod packing, the Proposed Rule includes a prescribed maintenance schedule or control of the leakage by routing it to a process (such as the engine combustion air). An additional option- should be included- the use of condition-based maintenance practices. Condition based maintenance may extend the operation of functional rod packing, precludes premature and wasteful rod packing maintenance/replacement, and encourages the development of innovative rod packing technologies. EPA has acknowledged that condition-based maintenance is a practical approach in its Natural Gas STAR lessons learned document, "Reducing Methane Emissions from Compressor Rod Packing System." A draft California Air Resources Board (CARB) regulation for oil and gas operations includes condition-based maintenance for reciprocating compressor rod packing, with a leak threshold of >2 SCFM requiring maintenance. The INGAA DI&M Guidelines include condition-based maintenance for reciprocating compressor rod packing. Since EPA's Natural Gas STAR program has demonstrated this work practice, it should be included as an alternative to the Proposed Rule requirements.

Companies understand the value of rod packing monitoring and maintenance/replacement programs and have instituted these programs as part of safety and standard maintenance practices. The final rule should include condition-based maintenance practices such as those in INGAA's DI&M program. These include:

Rod packing condition-based maintenance, with performance assessed by measuring the rod packing leak rate in accordance with applicable industry standard practices (e.g., as defined in Subpart W procedures);

A leak rate exceeding 2 SCFM would require rod packing maintenance/replacement at the next unit shutdown: A nine-month window is necessary to allow a critical unit to continue operating during a high-use season. Maintenance will occur sooner if the unit is shutdown; and

Monitoring would occur annually, which is consistent with the CARB proposal. A leak rate less than 2 SCFM demonstrates acceptable rod packing leakage.

Reliability engineering has advanced from following antiquated, periodic (i.e., preventative) maintenance to more use of predictive or condition-based maintenance, because it has been demonstrated that condition-based maintenance improves operational reliability and performance. Subpart OOOOa should not limit state-of-the art approaches or advancements in

technology and maintenance procedures. Condition-based maintenance should be added as a compliance option for reciprocating compressor rod packing.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion on this issue.

Commenter Name: Pamela Lacey, Chief Regulatory Counsel
Commenter Affiliation: American Gas Association (AGA)
Document Control Number: EPA-HQ-OAR-2010-0505-6936
Comment Excerpt Number: 17

Comment: EPA Should Incorporate Condition-Based Maintenance Programs Into Its Proposed Standard For Reciprocating Compressor Rod Packing Maintenance.

EPA's proposed standard for reciprocating compressors would require a prescribed maintenance schedule or routing the emissions to a process via a closed vent system under negative pressure. AGA appreciates the flexibility that EPA has afforded operators with these two alternative standards, but also encourages EPA to allow the use of condition-based maintenance practices, which generally compare baseline packing leakage and piston wear against the current leak rate to inform operators about necessary maintenance to reduce emissions. In addition to controlling emissions, condition based maintenance may extend the operation of functional rod packing, eliminate premature and wasteful rod packing maintenance/replacement, and encourage the development of innovative rod packing technologies. In cases where rod packing leakage increases quicker than is typical, condition-based maintenance can result in earlier maintenance than EPA's proposed prescribed maintenance schedule.

Condition-based maintenance has been a proven successful technique for reducing methane emissions through the Natural Gas STAR program. In this program, rod packing leaks were periodically monitored and the value of the incremental leaked gas (relative to leak rates for "new" packing) was compared to the rod packing maintenance cost. When the incremental lost gas value exceeded the maintenance/replacement cost, the rod packing maintenance was determined to be cost-effective.

Since T&S operators do not own the gas, a different performance metric would be needed. AGA recommends a metric based on a defined leak rate or change in leak rate over time. An example is available from a draft California Air Resources Board (CARB) regulation for oil and gas operations, which includes condition-based maintenance for reciprocating compressor rod packing and a leak rate above 2 standard cubic feet per minute (SCFM) requiring maintenance.

Rod packing maintenance programs are common for T&S operations as part of safety and standard maintenance practices. AGA recommends adding the following alternative to prescribed maintenance, with the operator selecting their preferred approach:

Rod packing condition-based maintenance, with performance assessed by measuring the rod packing leak rate in accordance with industry standard practices (e.g., as defined in Subpart W).

A leak rate above 2 SCFM requires rod packing maintenance/replacement within nine months or during the next unit shutdown, whichever is sooner.

Annual monitoring, where a leak rate of less than 2 SCFM demonstrates acceptable rod packing leakage.

AGA urges EPA to expand its proposed standards for reciprocating compressors to include these alternative maintenance programs and allow operators flexibility in reducing emissions by following one of these alternative methods or EPA's proposed standard.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion on this issue.

Commenter Name: C. Wyman
Commenter Affiliation: American Gas Association
Document Control Number: EPA-HQ-OAR-2010-0505-6874
Comment Excerpt Number: 20

Comment: EPA Should Incorporate Condition-Based Maintenance Programs Into Its Proposed Standard For Reciprocating Compressor Rod Packing Maintenance. EPA's proposed standard for reciprocating compressors would require a prescribed maintenance schedule or routing the emissions to a process via a closed vent system under negative pressure. AGA appreciates the flexibility that EPA has afforded operators with these two alternative standards, but also encourages EPA to allow the use of condition-based maintenance practices, which generally compare baseline packing leakage and piston wear against the current leak rate to inform operators about necessary maintenance to reduce emissions. In addition to controlling emissions, condition-based maintenance may extend the operation of functional rod packing, eliminate premature and wasteful rod packing maintenance/replacement, and encourage the development of innovative rod packing technologies. In cases where rod packing leakage increases quicker than is typical, condition-based maintenance can result in earlier maintenance than EPA's proposed prescribed maintenance schedule.

Condition-based maintenance has been a proven successful technique for reducing methane emissions through the Natural Gas STAR program. In this program, rod packing leaks were periodically monitored and the value of the incremental leaked gas (relative to leak rates for "new" packing) was compared to the rod packing maintenance cost. When the incremental lost gas value exceeded the maintenance/replacement cost, the rod packing maintenance was determined to be cost-effective.

Since T&S operators do not own the gas, a different performance metric would be needed. AGA recommends a metric based on a defined leak rate or change in leak rate over time. An example is available from a draft California Air Resources Board (CARB) regulation for oil and gas operations, which includes condition-based maintenance for reciprocating compressor rod packing and a leak rate above 2 standard cubic feet per minute (SCFM) requiring maintenance.

Rod packing maintenance programs are common for T&S operations as part of safety and standard maintenance practices. AGA recommends adding the following alternative to prescribed maintenance, with the operator selecting their preferred approach:

- Rod packing condition-based maintenance, with performance assessed by measuring the rod packing leak rate in accordance with industry standard practices (e.g., as defined in Subpart W).
- A leak rate above 2 SCFM requires rod packing maintenance/replacement within nine months or during the next unit shutdown, whichever is sooner.
- Annual monitoring, where a leak rate of less than 2 SCFM demonstrates acceptable rod packing leakage.

AGA urges EPA to expand its proposed standards for reciprocating compressors to include these alternative maintenance programs and allow operators flexibility in reducing emissions by following one of these alternative methods or EPA's proposed standard.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion on this issue.

Commenter Name: Gary Buchler
Commenter Affiliation: Kinder Morgan, Inc.
Document Control Number: EPA-HQ-OAR-2010-0505-6857
Comment Excerpt Number: 30

Comment: In addition, Kinder Morgan recommends that EPA provide an alternative option for operators to utilize a condition-based maintenance program for reciprocating compressor rod packing, with a leak threshold of 2 scfm, as described in INGAA's comments. This would offer operators the flexibility to ensure proper maintenance and operation of reciprocating compressors.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion of this issue.

Commenter Name: Matthew D. Hall
Commenter Affiliation: Consumers Energy Company
Document Control Number: EPA-HQ-OAR-2010-0505-6862
Comment Excerpt Number: 5

Comment: Proposed Reciprocating Compressor Rod Packing Maintenance:

EPA's proposed standard for reciprocating compressors would require a prescribed maintenance schedule or routing the emissions to a process via a closed-vent system under negative pressure. Consumers Energy appreciates the flexibility with these two alternative standards, but also encourages EPA to allow the use of condition-based maintenance practices.

These practices compare baseline packing leakage and piston wear against the current leak rate to inform operators about necessary maintenance to reduce emissions. In addition to controlling emissions, condition based maintenance may extend the operation of functional rod packing, eliminate premature and wasteful rod packing maintenance/replacement, and encourage the development of innovative rod packing technologies. In cases where rod packing leakage increases quicker than is typical, condition-based maintenance can result in earlier maintenance than EPA's proposed prescribed maintenance schedule.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion of this issue.

Commenter Name: Don Anderson, Director of Environmental
Commenter Affiliation: MarkWest Energy Partners, L.P.
Document Control Number: EPA-HQ-OAR-2010-0505-6957
Comment Excerpt Number: 32

Comment: EPA should revise § 60.5385(a) to require rod packing maintenance rather than rod packing replacement. Currently, proposed § 60.5385(a) states: "You must replace the reciprocating compressor rod packing before the compressor has operated 26,000 hour." For reciprocating compressors, MarkWest suggests "replace" should be changed to "inspect and maintain." In this respect, MarkWest supports America's Natural Gas Alliance's comments and position in its 2012 NSPS OOOO comments on this issue.

We recommend the final rule refer to rod packing maintenance rather than rod packing replacement. The rod packing components associated with restoring performance may not all need to be discarded, and some components may not need to be replaced. EPA's proposed terminology may inadvertently preclude operators from using proven maintenance practices to address rod packing leakage.

The proposed rule should also clarify that a control system using wet seals with a closed vent system or a dry seal system is an acceptable control strategy. This was permissible under the 2012 NSPS OOOO. The same rationale still applies and the two rules should be consistent.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion of this issue. The rule defines a centrifugal compressor affected facility as a wet seal centrifugal compressor, therefore, a dry seal centrifugal compressor is not an affected facility and is not regulated under the rule.

Commenter Name: Kathleen M. Sgamma, Vice President, Government and Public Affairs
Commenter Affiliation: Western Energy Alliance
Document Control Number: EPA-HQ-OAR-2010-0505-6930
Comment Excerpt Number: 53

Comment: Currently, proposed § 60.5385(a) states: "You must replace the reciprocating compressor rod packing before the compressor has operated 26,000 hour." For reciprocating compressors, the Alliance suggests "replace" should be changed to "inspect and maintain." In this respect, we support America's Natural Gas Alliance's (ANGA) comments and position in its 2012 NSPS OOOO comments on this issue:

We recommend the final rule refer to rod packing maintenance rather than rod packing replacement. The rod packing components associated with restoring performance may not all need to be discarded, and some components may not need to be replaced. EPA's proposed terminology may inadvertently preclude operators from using proven maintenance practices to address rod packing leakage.

Response: See section VIII.C.3 of the preamble to the final rule for a discussion of this issue.

Commenter Name: Greg Amimon, Director,
Commenter Affiliation: Environmental Northern Natural Gas, Berkshire Hathaway Energy Pipeline Group (BHE)
Document Control Number: EPA-HQ-OAR-2010-0505-6933
Comment Excerpt Number: 6

Comment: EPA proposes under § 60.5385a(a)(l) and (2) a requirement that rod packing for reciprocating compressors be changed every 26,000 hour and no later than every 36 months. The BHE Pipeline Group recommends that the EPA consider the option to monitor rod packings after 26,000 hours and replace only when the condition of the packing merits replacement as per manufacturer recommendations. Once the packing merits replacement, the BHE Pipeline Group suggests the rod packing would be required to be placed on a delay of repair list to be changed at the next shutdown, similar to that proposed in §60.5416a(b)(10). This method is cost effective and reduces waste generation, instead of changing the packing while it still has useful life.

Response: See section VIII.C.3 to the preamble of the final rule for a discussion on this issue.

7.8 Reciprocating Compressors - Other

Commenter Name: Matthew Hite
Commenter Affiliation: Gas Processors Association (GPA)
Document Control Number: EPA-HQ-OAR-2010-0505-6881
Comment Excerpt Number: 45

Comment: EPA Did Not Fully Modify Rule Language When It Allowed Use of Closed Vent Systems for Reciprocating Rod Packing Emission Control

In the preamble to the December 31, 2014 revisions to Subpart OOOO, EPA described changes regarding the use of closed vent systems for reciprocating rod packing emission controls: "We are revising the continuous compliance demonstration provisions in § 60.5415(c)(4) to reflect that the source must comply with 60.5416(a) and (b) rather than § 60.5411(a) and (b)." 79 Fed. Reg. at 79,023. However, EPA did not fully execute changes to the December 31, 2014 version of OOOO that were described in the preamble. Likewise, those changes were not included in the proposed rule for Subpart OOOOa. As such, these changes still need to be made in OOOO and carried through to OOOOa as well. GPA proposes that EPA revise 40 C.F.R. §§ 60.5415(c)(4) and 60.5415a(c)(4) as follows:

60.5415(c)(4) You must operate the rod packing emissions collection system under negative pressure and continuously comply with the closed vent requirements in ~~§60.5411(a)~~ ***60.5416(a)****.*

60.5415a(c)(4) You must operate the rod packing emissions collection system under negative pressure and continuously comply with the closed vent requirements in ~~§60.5411a(a)~~ ***60.5416a(a)****.*

In addition, EPA stated in the December 31, 2014 preamble that "[w]e are amending §60.5420(c)(6) through (9) to add reciprocating compressors as sources subject to these recordkeeping requirements." 79 Fed. Reg. at 79,023. Thus, this language change is still needed in Subpart OOOO. (EPA correctly revised the analogous language in OOOOa.) Consistent with EPA's proposal for 40 C.F.R. § 60.5420a(c)(6), 40 C.F.R. § 60.5420(c)(6) should be amended as follows:

60.5420(c)(6) Records of each closed vent system inspection required under §60.5416(a)(1) ***and (2)*** *for centrifugal* ***or reciprocating*** *compressors or §60.5416(c)(1) for storage vessels.*

In addition, GPA is concerned that EPA's option allowing rod packing emissions to be collected under negative pressure and sent to a control device could potentially lead to significant safety issues. See 40 C.F.R. §§ 60.5385(a)(3) and 60.5385a(a)(3) ("Collect the emissions from the rod packing using a rod packing emissions collection system which operates under negative pressure and route the rod packing emissions to a process through a closed vent system...."); see also 40 C.F.R. §§ 60.5415(c)(4) and 60.5415a(c)(4). Operating a crankcase collection system under negative pressure (i.e. in a vacuum) leads to significant safety issues due to the possibility of oxygen being introduced into the system. Crankcases are not designed to operate at pressures greater than 2 psi because of issues with gaskets and seals in the crankcase will occur. Therefore,

in addition to the technical corrections described above, we urge EPA to eliminate the requirement to collect emissions from rod packing systems under negative pressure. Specifically, we recommend that 40 C.F.R. § 60.5385a(a)(3) be revised to state:

Collect the emissions from the rod packing using a rod packing emissions collection system ~~which operates under negative pressure~~ and route the rod packing emissions to a process through a closed vent system....

This issue is also appears in Subpart OOOO, therefore a revision should also be made to 40 C.F.R. § 60.5385(a)(3), as follows:

Collect the emissions from the rod packing using a rod packing emissions collection system ~~which operates under negative pressure~~ and route the rod packing emissions to a process through a closed vent system....

Response: The EPA appreciates the commenter bringing the oversight with the language in §60.5415(c)(4) to our attention and we have corrected the language in the final rule. With respect to changing the provision for rod packing emissions collection system requirement to operate under negative pressure, see the response to DCN EPA-HQ-OAR-2010-0505-6884, Excerpt 68.

Commenter Name: Pamela Lacey, Chief Regulatory Counsel
Commenter Affiliation: American Gas Association (AGA)
Document Control Number: EPA-HQ-OAR-2010-0505-6936
Comment Excerpt Number: 28

Comment: EPA Should Clarify Its Intention to Regulate Compressor Stations Associated with "Underground" Storage.

The proposed rule defines "compressor station site" to include "compressors that move natural gas at increased pressure through gathering or transmission pipelines, or into or out of storage." Because "storage" is not defined, the proposed rule could impose fugitive emissions requirements not just on compressor stations used to move natural gas into or out of underground storage, but also compressor stations at liquefied natural gas (LNG) storage and propane storage for peak shaving facilities. Because there is no justification or cost-benefit analysis for the inclusion of LNG or propane storage for peak shaving facilities, AGA encourages EPA to revise the definition of "compressor station site" to clarify that storage is limited to underground storage.

EPA has made no indication that it intends to regulate compressor stations at LNG and propane storage facilities. The proposed rule, including EPA's supporting analysis, is virtually silent on what the Agency means by "storage." However, if EPA had intended to include LNG and propane storage facilities, a broader set of data, including the cost imposed on peak-shaving facilities, would be necessary to support including the compressors stations located at the nearly 75 LNG peak shaving facilities located in the U.S. This conclusion is supported by EPA's

website, which describes natural gas transmission and storage to include (1) transmission and compressor stations; (2) transmission pipeline; and (3) underground storage.

Furthermore, there is no environmental benefit for including these facilities. The Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration subjects LNG storage facilities to stringent regulations requiring the performance of leak surveys and permanent repairs for safety concerns. Under 49 CFR Part 193, LNG storage terminals are required to install leak and flammable gas detection systems, to monitor those systems continuously, and to repair any leaking or defective component. These requirements will likely identify and address any fugitive emissions before they would be identified through the proposed LDAR for fugitive emissions at compressor stations. As a result, the negligible fugitive emissions associated with these compressor stations do not warrant the increased regulatory burden of subjecting these facilities to the proposed NSPS. The minimal amount of fugitive emissions from LNG storage facilities is supported through the GHGRP data. In both 2013 and 2014, only 5 of the nearly 75 LNG storage facilities in the U.S. reported under the GHGRP, suggesting that nearly all of these facilities do not meet the 25,000 CO2e reporting threshold, even including CO2 from combustion emissions as well as their minimal fugitive methane emissions.

To ensure that LNG and propane peak shaving storage facilities are not unnecessarily included in the proposed rule, AGA encourages EPA to revise the definition of compressor station site as follows:

Compressor station site means any permanent combination of one or more compressors that move natural gas at increased pressure through gathering or transmission pipelines, or into or out of underground storage, as defined in 40 C.F.R. §98.230(a)(5), on a natural gas transmission line. This includes, but is not limited to, gathering and boosting stations and transmission compressor stations.

By making this revision, EPA will ensure that compressor stations at LNG and propane peak shaving storage facilities are not unintentionally regulated.

Response: The EPA disagrees with the commenter that the EPA should revise the definition of a compressor station to specifically refer to underground storage. The commenter's question appears to be more a reflection of whether the facilities for storage of LNG and propane peak shaving storage are considered to be part of the natural gas transmission and storage segment. If these facilities are in the natural gas transmission and storage segment, then the compressor stations would be covered by the rule. If these facilities are in the distribution segment, then the compressor stations are not covered by the final rule.

Commenter Name: Pamela Lacey, Chief Regulatory Counsel
Commenter Affiliation: American Gas Association (AGA)
Document Control Number: EPA-HQ-OAR-2010-0505-6936
Comment Excerpt Number: 29

Comment: EPA Should Clarify Its Intention To Only Regulate Centrifugal Compressors, Reciprocating Compressors, And Pneumatic Devices At Compressor Stations.

Based on EPA's summary of the proposed rule in the preamble and support documents, AGA believes that EPA only intends to regulate centrifugal compressors, reciprocating compressors, and pneumatic devices at compressor stations. Thus, this equipment located outside of the compressor station fence line, for example at metering stations, would not be affected. However, the applicability sections and definitions in the proposed rule could lead to the conclusion that these equipment types are affected sources in T&S regardless of their location—i.e., not limited to equipment at compressor stations.

AGA encourages EPA revise section 60.5365a as follows so that it is clear that the "affected facility" for this equipment is limited to equipment at compressor stations.

(b) Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals, located at a compressor station site as defined in §60.5430a. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

(c) Each reciprocating compressor affected facility, which is a single reciprocating compressor, located at a compressor station site as defined in §60.5430a. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

(d)(1) Each pneumatic controller affected facility not located at a natural gas processing plant, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh, located at a compressor station as defined in §60.5430a.

If EPA intends for its proposed rule to have broader applicability by including this equipment not located at compressor stations, such as devices at small metering stations, then EPA's supporting analysis justifying its proposed rule is lacking. Additional analysis would be needed to accurately assess the costs and benefits associated with regulating this equipment outside of the compressor station fence line.

Response: See response to DCN EPA-HQ-OAR-2010-0505-6936, Excerpt 18.

Commenter Name: Douglas E. Jones, Chairman
Commenter Affiliation: Pennsylvania Grade Crude Oil Coalition (PGCC)
Document Control Number: EPA-HQ-OAR-2010-0505-6239
Comment Excerpt Number: 7

Comment: Finally, with respect to wellsite compression, conventional operators in Pennsylvania use very few true wellsite compressors. However, when in use these are very small horsepower machines and the imposition of requirements to monitor and replace packing would impose a cost with very little benefit.

PGCC would support an exemption for stripper well sites or an exemption for compressors of less than 100 horsepower.

Response: The EPA did not define compressors located at well sites as affected facilities under the rule. Therefore, no exemption is necessary. The EPA disagrees that an exemption for compressors under 100 horsepower is warranted. Please see the TSD to the proposal for further information on the compressor emissions data we assessed.

Commenter Name: Laredo Petroleum
Commenter Affiliation: Laredo Petroleum
Document Control Number: EPA-HQ-OAR-2010-0505-6474
Comment Excerpt Number: 8

Comment: How is a company that leases engines expected to keep track of rod packing changes, as proposed on page 56595, column 2, under Section B. Summary of the Major Provisions of the Regulatory Action, on leased engines? These engines have potentially been in the field for years prior to being leased by the current company.

Response: The rule requirements apply to new, modified, or reconstructed reciprocating compressors after the compliance dates outlined in the rule. Any compressors that are existing are not regulated by the rule. The owner/operator would need to establish appropriate recordkeeping only for the newly installed, modified, or reconstructed units.

Commenter Name: Matthew Hite
Commenter Affiliation: Gas Processors Association (GPA)
Document Control Number: EPA-HQ-OAR-2010-0505-6881
Comment Excerpt Number: 47

Comment: Inconsistent Requirements for Reciprocating Compressors

For reciprocating compressor affected facilities regulated under Subpart OOOO, the operator must track the hours of operation or the number of months since initial startup, since October 15,

2012, or since the previous rod packing replacement, whichever is later. EPA proposes a similar requirement for reciprocating compressor affected facilities under Subpart OOOOa. The language in 40 C.F.R. §§ 60.5410(c)(1) and 60.5410a(c)(1) should be modified as suggested below in order to reflect this requirement, to avoid compliance confusion, and to be consistent with the language in 40 C.F.R. §§ 60.5420(b)(4)(i), 60.5420(c)(3)(i), and 60.5415(c)(1).

60.5410(c)(1): If complying with §60.5385(a)(1) or (2), during the initial compliance period, you must continuously monitor the number of hours of operation or track the number of months since ***initial startup, October 15, 2012, or*** *the last rod packing replacement****, whichever is later****.*

60.5410a(c)(1): If complying with §60.5385a(a)(1) or (2), during the initial compliance period, you must continuously monitor the number of hours of operation or track the number of months since ***initial startup, September 18, 2015, or*** *the last rod packing replacement****, whichever is later****.*

Response: The affected facility will either be regulated by subpart OOOO or subpart OOOOa depending on the date of installation, modification, or reconstruction. Therefore, revisions as suggested by the commenter are not necessary to clarify compliance dates.
